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FOUNDRY TRADE JOURNAL

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Potential Economies

Whilst the future prospects of the foundry industry as a whole appear to be quite good, some sections are unquestionably worried as to the impact of the "credit squeeze" on their output. Yet if the "squeeze" is effective it should—through means not clear to us, but which are accepted by most economists—help the export trade to the general good of the country. The directors of concerns adversely affected by the "squeeze" point out the potentially great economies which could be effected by the Government itself in the conduct of its various departments and financially sponsored organizations. Whilst many, and indeed most, of the latter are alike admirable and desirable, their continuation in being or their activities should be reviewed or curtailed during periods of strained economy.

We have in mind such reports as the various Census of Production (usually several years late) and the exhaustive and no doubt expensive statistical researches which have informed us "that the term of service given by women employees is shorter than that to be associated with the male"; "that the average salary paid to the office staff in the City of London is higher than in the West End"; "that foremen are by no means so keen on works joint consultative councils as the managing directors," etc. Many of these reports are just confirmation of what interested people have long known, and the discontinuance of such work would leave no void in the world's useful stock of knowledge. We are informed that a seventh survey is to be made of salaries paid to office workers—the sample being of the order of 100,000 clerks working in probably 1,000 organizations. In all seriousness, when there is such a real need to economize in non-productive effort, we ask why such a huge task is to be undertaken and—when the figures are duly printed—to what good purpose the results can be put.

Another economy could be effected by the ruthless eradication of duplication. For instance, in the field of productivity there are the periodical publications of bulletins by two distinct bodies. These cover exactly the same ground in two different formats. The functions of both could with advantage be handled by the British Productivity Council. Even this body could economize, as amongst its most recent publications was one devoted to publicity for the National Industrial Fuel Efficiency Service—an excellent organization well capable of "beating its own drum." Our advice to the leaders of industry serving on committees of national organizations, is when they are asked to sanction expenditure on new projects and publications, to ask themselves whether these will be consigned initially to the wastepaper basket, or if not, still have their pages unsoiled two years after their first appearance.

National Foundry Craft Training Centre

Mr. A. N. Wormleighton, joint managing director of the Phosphor Bronze Company, Limited, has resigned the chairmanship of the National Foundry Craft Training Centre's management committee, owing to increasing pressure of business. He remains a member of the committee and retains his seat upon the board of trustees. Mr. Wormleighton joined the committee on the establishment of the Centre in 1947, and has been its chairman since 1948. At a meeting of the management committee recently, his resignation was accepted and he was warmly thanked for the considerable contribution he had made to the development and success of the Centre. Mr. J. Hird, works manager of Rudge Littley, Limited, West Bromwich (at whose foundry the Centre is accommodated), and who has served on the committee since 1948 as the representative of the Institute of British Foundrymen, was elected chairman.

Organization of the Centre

The Centre provides extra training for apprentices in the foundry industry, both ferrous and non-ferrous, aimed at broadening and supplementing their works training by means of four progressive courses, each lasting four weeks at a time in each of four successive years. They work under a qualified full-time instructor, Mr. Francis D. Roper, a practical foundryman of wide experience. When off duty, the apprentices live at a residential club nearby, under the care of a warden and his wife. Each month's course costs approximately £21, paid by the firm sending the apprentices; this figure includes the boy's club accommodation and meals.

The general direction of the Centre is supervized by a Board of Trustees, of which the chairman is Mr. S. H. Russell, president of the British Cast Iron Research Association, and head of the firm of S. Russell & Sons, Limited, Leicester. The other trustees are Mr. John W. Gardom, of John Gardom & Company, Ripley, Mr. Kenneth Marshall, director, Council of Ironfoundry Associations, and Mr. Wormleighton. The management committee, which is concerned with the day-to-day working and equipment of the Centre and the conduct of the club, includes at present (in addition to Mr. Wormleighton and Mr. Hird), Mr. H. Darville (Rudge Littley, Limited), Mr. G. A. Green (Birmingham Aluminium Castings (1903) Company, Limited), and Mr. G. R. Shotton (Shotton Bros., Limited). Also members are Mr. John Collett (training officer), and Mr. B. H. Tripp (information and Press officer), Council of Ironfoundry Associations. The Centre's secretaries, Heathcote & Coleman, 69, Harborne Road, Edgbaston, Birmingham, 15, who are also secretaries of other foundry organizations, both ferrous and non-ferrous, are represented on both the board of trustees and the management committee by Mr. L. H. Cleaver, J.P., A.C.A. Heathcote & Coleman were appointed to the secretaryship in succession to Mr. R. Forbes Baird, who recently retired from that office.

Latest Foundry Statistics

The Council of Ironfoundry Associations states that the following number of ironfoundry workers were employed in the United Kingdom during the week ending December 3, 1955:—137,677 males; 10,403 females; making a total of 146,080. The increase registered during the month of November was 587, whilst compared with November 27, 1954, the gain was 4,682.

Correspondence

EYE PROTECTION FOR METAL POURERS

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—Recently the JOURNAL reported the imposition of a fine on a firm for failing to provide suitable eye-protection for a man working with molten metal. Although goggles were available, "most men refused to wear them because they steamed up."

This is a very common state of affairs in foundries, because no completely suitable eye protection is available. Such protection should provide (1) protection from flying droplets of metal, and (2) protection from glare but, at the same time, should allow clear visibility to enable the workman to (*a*) see where he is walking; (*b*) see to pick up tools, etc., and (*c*) see the runner cup.

I find that these requirements are met by an eyeshade of the type traditionally worn by newspaper editors and film directors. If an industrial version, of adequate size and thickness, in blue, non-inflammable material could be made, a comfortable and safe means of eye-protection would be available, to which workmen should have no objection.—Yours, etc.,

"SAFETY FIRST."

January 1, 1956.

Mond Nickel Fellowships

The Mond Nickel Fellowships Committee invites applications for five Fellowships of an approximate value of £900 to £1,200 each for 1956. Fellowships will be awarded to selected candidates of British nationality with degree, or equivalent qualifications, to enable them to obtain wider experience and additional training in industrial establishments, at home or abroad, to make them more suitable for future employment in senior technical and administrative positions in British metallurgical industries. Each Fellowship will cover one full working year. Applicants will be required to state details of the programme they wish to carry out. Particulars and forms of application are available from the secretary, Mond Nickel Fellowships Committee, 4, Grosvenor Gardens, London, S.W.1.

World Power Conference

The fifth World Power Conference is to be held in Vienna from June 17 to 23. The general programme now available from 201-2, Grand Buildings, Trafalgar Square, London, W.C.2, details the technical and social activities, which are extensive. About 27 papers are being submitted from this country but a total of 300 have been received. A number of post-conference tours have been arranged which extend into Germany, Italy and Yugoslavia. The conference is open to all persons possessing appropriate professional qualifications in the British fuel and power and related industries (including "user" industries).

IVE Midland Section

Last Friday, the Midland section of the Institute of Vitreous Enamellers held its annual dinner at the White Horse Restaurant, Birmingham. The function, ably organized by the secretary, Mr. D. Heath, attracted a record attendance of 96.

Co-operation between Engineer and Foundryman on Casting Design*

By Georges Blanc and Marcel Jaumain

The feeling that has been with British founders for many years—that there should be greater co-operation with engineers on casting design—was crystallized by Mr. John Bell in his presidential address in 1954 when he said the Institute of British Foundrymen should take the initiative in approaching British engineers on a co-operative basis. The second phase was the creation by the IBF of sub-committee T.S.50, the objective of which is to formulate suitable agreed recommendations. Another phase is represented by the Paper printed in what follows—a review of what the French foundry organization has already done and envisaged in the same field. The steps are so logically set out and well illustrated that no further introduction is needed.

HISTORICAL

Need for Guidance

In the age of hewn, fashioned, or polished stone, early bronzefounders must have had some degree of success in creating castings from a relatively hard material which would easily take a variety of shapes; the metal flowed easily in the mould and gave, on solidification, all the required shapes: tools, arms, personal ornaments and works of art. How interesting to have been one of these torque† wearers from Asia Minor who, according to certain authoritative archaeologists of the present day, must have spread the art of bronze across the whole of Europe 4,000 years ago. It is probable that their patrons accepted the difficulties associated with the working of the metal, and on the whole asked for casting shapes which were fairly easy to make.

The characteristics of the casting of alloy metals have not markedly changed, fundamentally, since this era. Moulding processes have, no doubt, developed but only to a relatively small extent; on the other hand, the requirements of the user have grown considerably, particularly during the last 30 years. The Authors have recently experienced a typical example of this change—the organization known as *l'Electricite de France* wished to produce an atlas of gamma-ray photographs to give inspectors a guide on casting properties which may be accepted, and on those defects which justify rejection of a casting. A number of foundrymen gave these new conditions of acceptance only a lukewarm reception, and suggested that castings forming components of equipment which had given satisfaction for 20 or 30 years should also be submitted to similar tests. The *Centre Technique*, which exists to promote technical advancement and also has to take into consideration any important and reasonable economic considerations, agreed to raise this question with *l'Electricite de France*. Their suggestions were met with a polite but firm refusal; they were informed that present-day operating speeds, and (particularly in connection with generators) the temperature ranges to which modern materials were subjected, bore no relation to service conditions of 30 years ago, and, consequently, defects which would have presented no difficulty in earlier materials could not be accepted under present-day conditions. Foundrymen can only accept this ruling, in the same way that they accept the increasingly complex designs of castings.

* Paper presented personally by the Authors at a meeting of the London branch of the Institute of British Foundrymen.

† TORQUE—a collar, necklace, bracelet or similar ornament worn especially by the ancient Gauls and Britons

The Authors . . . .

MR. GEORGES BLANC, who is now the research manager of the *Centre Technique des Industries de la Fonderie* attached to the Paris headquarters, was born in that city towards the end of the last century. After leaving the *Ecole Polytechnique* he studied at the *Ecole du Génie Maritime*, graduating with the degrees of diploma-engineer and B.Sc. He also studied law and economics, qualifying as a doctor in the former subject, and publishing a book on a phase of the latter. His works experience was gained with the Forges et Chantiers de la Mediterranée and Le Bronze Industriel. He joined the *Centre* in 1946.

MR. MARCEL JAUMAIN, who heads the steel-castings division of the *Centre Technique*, also located in Paris, was born in 1906. He is a graduate of both the Arts-et-Metiers and the Paris Foundry High School. All his industrial career has been spent in iron and steel founding, and has been specially concerned with the making of large castings for hydro-electric generating stations. He has on three occasions visited the United States in connection with studies of productivity and spheroidal-graphite cast iron. His association with the *Centre Technique* dates from 1954.

Co-operation on Casting Design

Difficulties

When a foundryman receives a drawing or a pattern from a customer which arouses the indignation of his foundry manager or foreman, he does not like to mention this unfavourable reception to the customer, first of all because the customer *is* the customer (and, in a business sense, the customer is always right), next, because of a kind of professional pride, and last but not least, because he is afraid that his rivals may not be so exacting and may be only too glad to accept the order without criticising the design.

These difficulties were not so pronounced in earlier days, at any rate in France: 30 years ago, when one of the Authors began work with a leading firm of manufacturers of marine engines, this firm had its own foundry and the foundry manager was in close touch with the head of the drawing office. The relation that existed was as between colleagues,

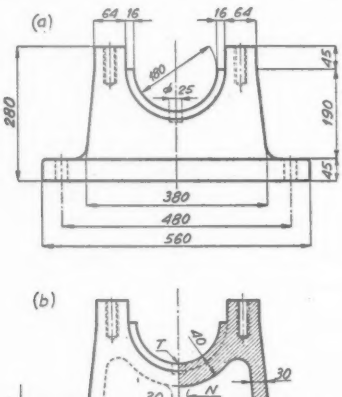

FIG. 1.—*Bearing block (a) too solidly designed and (b) designed with well-proportioned sections.*

and not as between manufacturer and customer, and designers frequently visited the foundry and workshop and could appreciate the importance of castings design. It is true that this was of small benefit, in view of the difficulties due to the lack of specialization in the foundry, which cast all kinds of metals and poured castings weighing less than a pound on the same floor, and using the same personnel, as for castings weighing several tons.

The importance of specialization is recognized more and more, and founding and engineering are becoming separate industries in France; due to this fact, designers know less and less of the difficulties the foundryman must contend with. Designers, on the other hand, have an increasingly better understanding of mechanical and thermo-dynamic requirements, and multiply their circulating systems for gas and water, reduce section thicknesses and add a profusion of flanges on every casting surface. At the same time, they require that castings shall be light in weight, and make disturbing reductions in section thicknesses at the most unexpected places. In view of this state of affairs, it seems necessary to draw the attention of design sections to the difficulties which result from them for the founder, the defects which may arise, and the excessive costs that may be involved.

One means of remedying the situation is to circulate widely, simple and easily-used guides on design, capable of drawing the designer's attention to correct methods of designing for casting.

Previous Work and Earlier Achievements

It is some time since this subject was first ventilated, and this has led to investigations and pub-

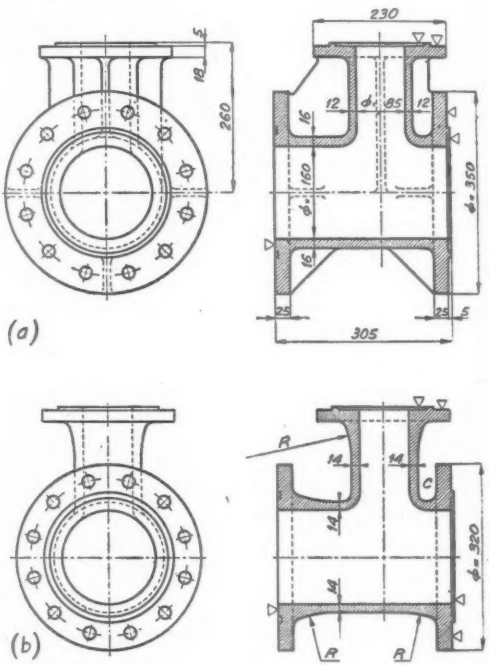

FIG. 2.—*Branch-pipe casting to withstand steam pressure: (a) defective design—irregular sections, flanges too wide and ribs too large; (b) correctly designed—sections standardized at 14 mm. tapered junctions, ribs eliminated and flanges reduced in diameter.*

lished work. Among the earliest, the Authors remember two British papers, *e.g.*, those of Preston[1] and F. C. Edwards.[2] At about this time, work was done in both France and Germany, and it is significant to note that the work nearly always concerned steel castings. In a paper presented to the International Foundry Congress in 1927 de-

voted to "The Design Section in a Foundry," Le Thomas emphasized the need for such investigations.

The results of this work were initially published in the form of separate articles in technical journals. The first work, to the Authors' knowledge, that was wholly devoted to the subject is the "Guide for the Use of Designers of Steel Castings

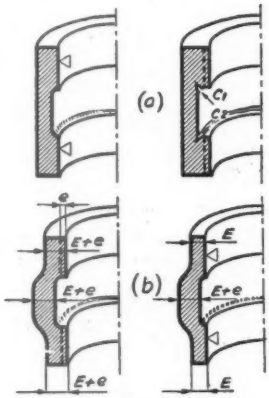

FIG. 3.—*Effect of machining allowance: Design (a) is poor, with risk of cracking at C; design (b) is an improvement, with even sections in the as-cast state. (E=minimum section required; e=machining allowance.) The machined casting is shown on the left in (a) and on the right in (b).*

for Marine Purposes"[3] initiated by the *Chambre Syndicale des Constructeurs de Navires et de Machines Marines*, edited by Mr. André, head of the foundry-service section at the Saint Chamond works of the Compagnie des Forges et Aciéries de la Marine et d'Homécourt, who was assisted in this work by a committee of which Mr. Ronceray, at that time head of the *Ecole Supérieure de Fonderie*, was chairman. This is a booklet of format

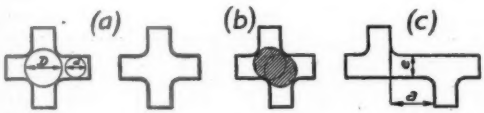

FIG. 4.—*Replacement of coincident section junctions by off-set junctions: Design (a) is bad because of the mass of metal* $\left(\frac{D}{d}\right)^2$ *at junctions; design (b) is very bad; design (c) is better, with dimension a greater than 2e.*

9 by 11 in., having about 60 pages and numerous illustrations. It is interesting to note that this work was produced by a professional body of users of castings, a certain number of whom possessed "tied" foundries, and with the co-operation of representatives from leading engineering works, most of whom also possessed foundries.

In about 1942, the *Association Française des Fondeurs de Malléable* asked the *Comité d'Organisation des Industries de la Fonderie* to prepare a guide on the design of malleable castings;[4] and the technical committee of the latter body, under the chairmanship of Mr. Le Thomas, prepared this publication in the form of a booklet of small format, running to 20 pages. At about the same time, following some work by the same technical committee, a booklet of similar size and purpose appeared entitled "Normal Technical Possibilities for Pressure Castings."[5] On this occasion, it was the professional foundry body itself which provided, through the *Centre Technique*, a guide on casting design.

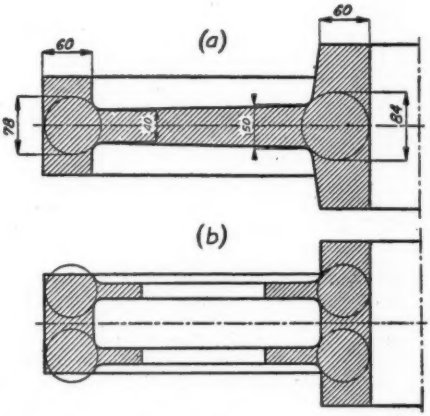

FIG. 5.—*Modification of an overhead railwheel, with substantial lightening out. Design (a), which is bad, has masses of metal:* $\left(\frac{78}{60}\right)^2 = 1.69$ *and* $\left(\frac{84}{60}\right)^2 = 1.96$. *The good design (b) reduces these to* $\left(\frac{d}{60}\right)^2 = 1.25$.

Design of Steel Castings

L'Association Française des Aciéries de Moulage (French Steelfounders' Association) made a similar approach to the *Centre Technique* shortly afterwards, and in 1948 a "Practical Guide to the Design of Steel Castings"[6] appeared, a work of 62 pages, 8 by 13 in., with 121 illustrations. This work is far more detailed than earlier publications, and this was made possible by the growing importance of the *Centre Technique*. The five-thousand copies of the first edition were exhausted by 1952, and a second edition of 4,000 copies appeared in 1953. By a similar arrangement, a "Guide to the Design of Grey-iron Castings"[7] was prepared and published in October, 1954, under the ægis of the

Co-operation on Casting Design

Commission Technique de la Métallurgie des Fontes of the *Centre Technique*. This work is of the same format and size as that mentioned earlier as emanating from the *Centre*.

Preparation of Handbooks

Although the various committees interested have taken a large part in issuing handbooks on the design of castings, an engineer from the *Centre Technique* has, none the less, been required to prepare the preliminary text to serve as a basis for discussion. On what data has he based his text? First of all, of course, on his own knowledge of founding, then on the best established practices, and

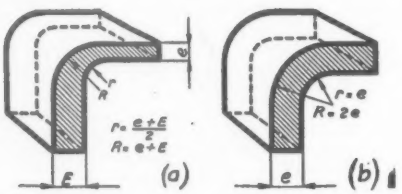

FIG. 6.—*L-junctions; radii to be given to the components according to wall thickness—(a) for unequal and (b) for equal wall thicknesses.*

on published information; there is now, in fact, fairly comprehensive literature on the subject.

These various factors would not be sufficient to produce an original work. The text would certainly be extremely logical, and the Authors know that the British sometimes smile at the French passion for logic, which does not always seem to them to agree with the actual facts. However, it must not be thought the French are not conscious of the gaps in reasoning; they always attach importance to

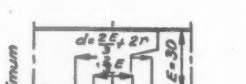

FIG. 7.—*Design for a junction at an angle less than 90 deg. and having unequal sections.*

practical knowledge and to properly-conducted experimental work, and this trend is increasing.

On the practical side, engineers attached to the *Centre* are in a particularly strong position, thanks to the contacts maintained by that organization with the 2,000 founders with whom it is constantly in touch by letter or visit. These founders do not hesitate to report any difficulties they meet in the production of castings, and they particularly emphasize those arising from poor design. It is equally important to be able to produce castings in the experimental foundry of the *Centre Technique's* laboratories where the effects of given types of design have been very well established.

In the course of the following survey of the text of the French "Guides," some of these experiments are illustrated by a number of examples. Moreover, there has been close co-operation between those members of staff responsible for the "Atlas of Foundry Defects"[8] and those who prepared the text of the "Guide to the Design of Castings," at any rate as far as grey iron is concerned (since the guide on steel-castings design preceded the work on foundry defects).

FRENCH "GUIDES"

The handbooks on the design of steel and grey-iron castings sponsored by the *Centre Technique* carry, first of all, a chapter on the properties of these materials, covering both service conditions such as mechanical properties and founding properties—castability, mechanism of solidification,

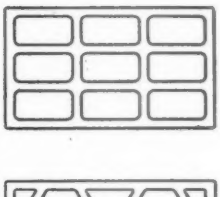

FIG. 8.—*Ribbing of a plate casting, the hexagonal design is much to be preferred to the quadrilateral type.*

shrinkage, structure, and section sensitivity. In the handbook on steel castings design, a chapter next follows on defects which may result from bad design: shrinkage defects, cracking, pinholing, and blowholes. It was thought advisable not to include a similar chapter in the handbook on design of grey-iron castings, mainly for psychological reasons, since on consideration, it was thought best in a work that was aimed particularly at the user, not to emphasize in this way anomalies which it was hoped would be eliminated sooner or later.

The next two chapters which follow in the guide to the design of steel castings are the most important in that book, one giving the rules of design favouring the production of metallurgically sound castings, the other containing the rules to be followed when considering practical pouring and moulding conditions.

Uniformity of Section

As an example of the preliminary rules mentioned above, may be quoted the design for a bearing-block housing (Fig. 1*) which was originally made in cast iron using massive sections, yet which can

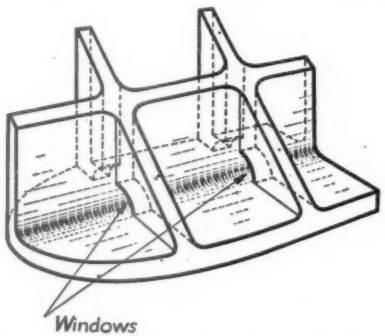

FIG. 9.—*Incorporation of "windows," shown by arrows, at the points of intersection of webs.*

be made in steel, providing that the sections are well proportioned and as regular as possible. Manufacture in steel resulted in a considerable reduction in weight, thus providing an improvement both from the point of view of the total weight involved and the cost of the casting.

Another instance of the application of the principle of uniform section is shown in Fig. 2; the original design included various section thicknesses of flanged pipe—harmful to the performance of this pressure-resisting casting. The external diameter of the flanges made the provision of ribs necessary, a design which involved a risk of cracking. The improved design, with pipe thicknesses of the same section, with tapered connections and flanges of smaller diameter, without ribs, is easier to deal with and gives just as rigid a casting. There is, however, some bulk of metal at the root of the flanges, but this can be taken care of by the use of suitable feeding methods. Uniformity of section must be allowed for in the as-cast state, taking machining tolerances into consideration (Fig. 3); thus, if a casting is required of uniform thickness in the as-cast state, it is necessary to allow in those parts of the final casting which are not to be machined, a thickness greater than those which are to be machined, the increase being equal to the machining allowance.

Elimination of Hot Spots

A chapter in the steel castings "Guide" is devoted to precautions to be taken against the formation of hot spots. This is an extremely important and exacting chapter: it includes consideration of junctions of sections and the question of joining sections by the use of fillets. The classic method of applying inscribed circles is outlined, giving an empirical calculation for the mass of metal (Fig. 4). It applies especially to bogie wheels, but certainly the arrangement suggested does not assist moulding (Fig. 5). The radius of fillets should be carefully selected: if too small, cracking may result, and if too great, hot spots and shrinkage defects may ensue.

When it is merely a question of two sections, whether equal or unequal, meeting at right angles, the solution is easy (Fig. 6). The formulæ given are a little complicated when the angle of junction is less than 90 deg., especially if the sections are unequal, and they are even more complicated when three sections are involved (Fig. 7). Similarly, the advantage can be shown of a hexagonal grid as compared with a rectangular grid, since the former permits a junction of four sections at 90 deg. to be replaced by a junction of three sections at 120 deg. (Fig. 8).

Cut-away and Hollow Sections

Cut-outs reduce the weight of a casting and avoid accumulations of metal. Situated at the base of ribs such cut-away design reduces mass at junctions

* Dimensions for all illustrations are shown in millimetres; surfaces to be machined are denoted by a triangle used as a pointer. Figs. 1 to 16 are taken from the steel castings "Guide" and Figs 17 to 19 from that for iron castings, and are reproduced by courtesy of the publishers.

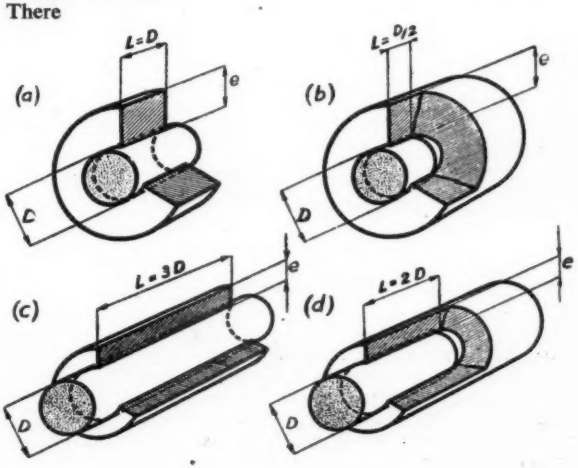

FIG. 10.—*Recommended dimension ratios for cored holes: (a) open both ends, where $D < 2e$ (maximum length D); (b) "blind" hole where $D < 2e$ (max. length $\frac{D}{2}$); (c) open ends, where $2e \leqslant D \leqslant 3e$ (max. length 3D); and (d) "blind" where $2e \leqslant D < 3e$ (max. length 2D).*

where several sections meet and lessens the risk of cracking (Fig. 9). Hollow sections raise difficult problems; the customer is sceptical when he is told that a hole costs more than the metal it replaces. On the other hand, he does not like to find, instead of a hole, a lump of burnt coresand which is particularly difficult to remove. Thus, an attempt has been made to give rules limiting length of holes in relation to diameter, especially when it is a question of " blind holes " (Fig. 10).

Tolerances

The chapter in the " Steel Guide " on dimensional accuracy is a particularly difficult one. This is a burning topic and one which has always been a subject of contention between foundryman and user. It is useful to remember that the difference between the actual dimensions of a casting and the exact dimensions envisaged arises from such causes as the degree of rapping during removal of the pattern,

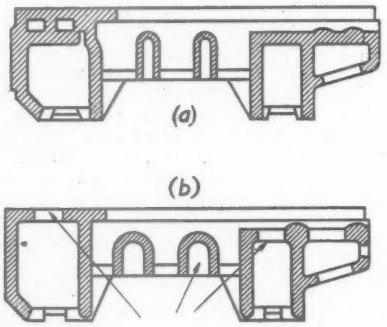

FIG. 11.—*Machine base: (a) Original defective design; (b) modified design facilitating the escape of gases because of the core with a double print. (The arrows indicate design modifications.)*

displacement of parts of the mould, displacement of cores, and sometimes slight uncertainty in predicting shrinkage behaviour. The " guide " gives a table of tolerances which it is advisable to accept. It also calls attention to the need, when designing bosses, to take possible variations into consideration if the bosses are to stand in relief. Machining allowances are also dealt with.

Feeding Arrangements

The rules outlined earlier do not require any advanced knowledge of the foundry or of moulding methods. On the other hand, the next chapter to be dealt with lays down rules which depend on the pouring and moulding arrangements.

First, it is concerned with principles such as the positioning of the massive parts of a casting so that they come in the upper half of the mould, the positioning of surfaces to be machined—which should preferably be in the lower half of the mould or placed vertically—and design arrangements facilitating the escape of gases by avoiding the use of cores that have no outlet, or at any rate by increasing the size of these cores to a sufficient extent (Fig. 11) for allowing the use of hollow cores.

The next chapter deals with the practical possibilities of directional feeding. It refers to tapered or " padded " feeder-heads, the object of which is to add a reinforcement of metal which will be removed during fettling or machining operations. Such

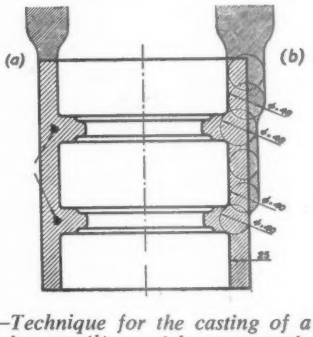

FIG. 12.—*Technique for the casting of a roll: (a) poor layout; (b) good layout carrying an enlarged feeder-system; (" draws " are indicated by arrows).*

feeding methods increase machining to some extent, but provide a remedy for constantly occurring shrinkage cavities (Fig. 12). With the same end in view, it is advisable in certain cases to design the casting asymmetrically so that the section increases gradually when nearing the feeder-head (Figs. 13 and 14).

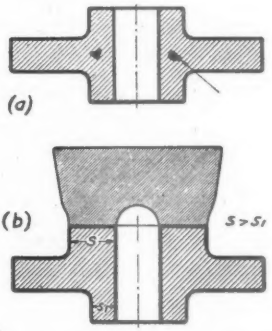

FIG. 13.—*Application of unsymmetrical design: (a) bad and (b) good; (" draws " are shown by the arrow.)*

Facilitating Moulding and Coring

In order to reduce the cost of castings, there is also some advantage in adopting certain measures to facilitate moulding. The following recommendations are given in this connection: (*a*) allow for suitable taper; (*b*) provide simple and sensible joining arrangements; (*c*) reduce the number of cores;

(*d*) arrange details suitably, and (*e*) break down complicated jobs into simple elements. The frame in Fig. 15 may be put forward as an example of simplified stripping arrangements. Not only should

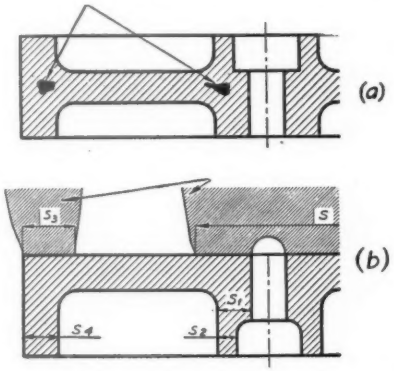

FIG. 14.—*Technique for the casting of a pulley: (a) poor design, with "draws" indicated by arrows; (b) good design, where the feeding heads are shown by arrows. The modifications in design ensure decrease in section from top to bottom.*

the number of cores be reduced, but the cores used should be supported by two prints, and unsupported cores should not be used; chaplets should be avoided as far as possible (Fig. 16).

Special Rules for Grey-iron Castings

The rules given in the "Guide to the Design of

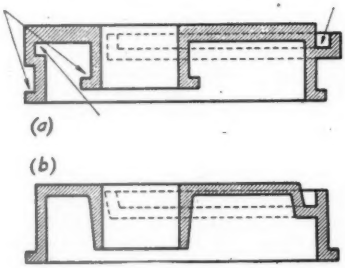

FIG. 15.—*Simplification of a bedplate: (a) defective design (down-stroke arrows show the parts of the pattern which cannot be stripped. The up-stroke arrow indicates awkward sand angles which form "hot spots"); (b) correct design, using an easily-strippable pattern, carrying pronounced draft.*

Grey-iron Castings" are presented somewhat differently. These include:

1. Design recommendations governed by structural factors.
2. Recommendations for obtaining sound castings.
3. Recommendations on safe and economical moulding methods.

This scheme has certain advantages in comparison with that described earlier. Many of the rules are

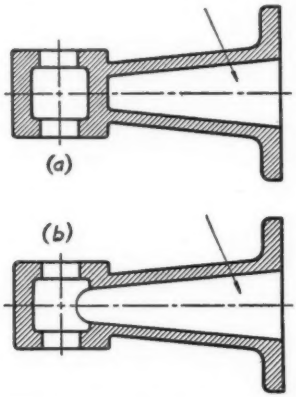

FIG. 16.—*Moulding simplified through design modification: (a) bad (the arrow shows poor print support); (b) good (arrow indicates a well-supported core).*

common to both "Guides," but some of them, of course, refer only to cast iron. There are, first, those rules governed by the service properties of cast iron: it is recommended that full advantage be

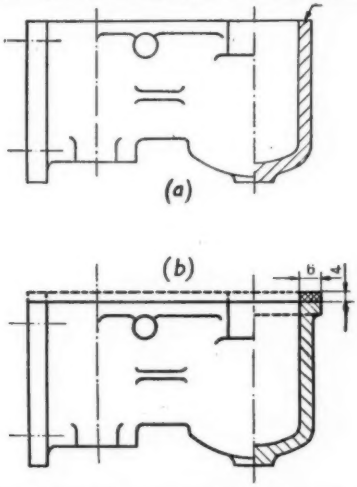

FIG. 17.—*Addition of extra metal to reduce chilling: (a) defective design (the arrow showing the chilled part); (b) improved design.*

taken of the strength of the material in compression, while exercising care when it is to be subjected to transverse or tensile stress. There are also rules

referring to the danger of chilling, which may make machining difficult or impossible (*e.g.*, Fig. 17, which is taken from the "Guide to the Design of Grey-iron Castings"). This shows a carburettor body which needs to be machined at high speed. The thin portion of the periphery is prone to chill. To reduce section devoted to the various hull components—the stem, stern-post, rudder seating, shaft housing, and rudder hole. However, the recent "Guides" are intended for a much larger audience, and the arrangement adopted makes the reasons behind the recommendations stand out more clearly, and consequently the reader is better able to apply them to the various specific cases he has to deal with. The

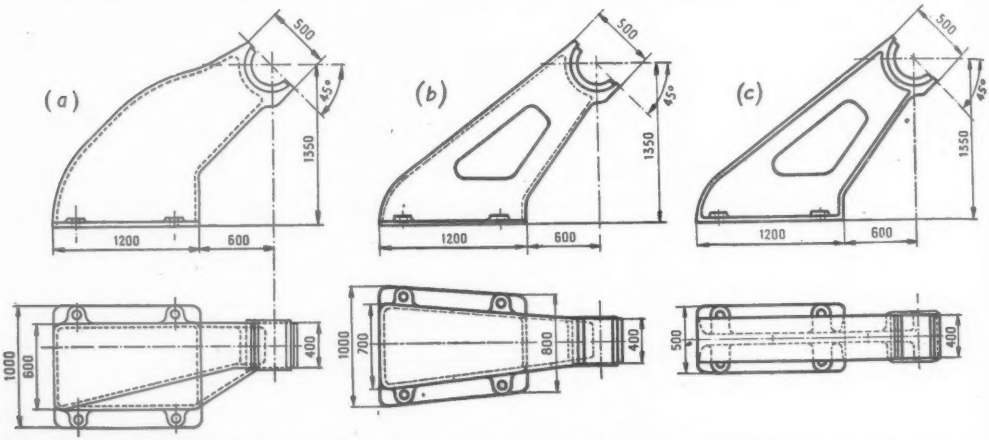

FIG. 18.—*Modification in the design of a casting in order to simplify patternmaking: (a) initial design; (b) improved design; (c) simplified design.*

the hardness at this point, the cooling rate is decreased by the addition of a lip and by increasing the machining allowance.

Experience has similarly proved the value of a chapter on the simplification of patterns. The time-honoured rule is to give preference to straight lines and flat surfaces which, moreover, contribute to the aesthetic appearance of the casting. Here again, the method of joining is important (Fig. 18). The elimination of external cores or false cores is emphasized (Fig. 19). Finally, this "Guide" includes a table summarizing the most suitable pattern and moulding methods to adopt according to the type of casting and the quantity required.

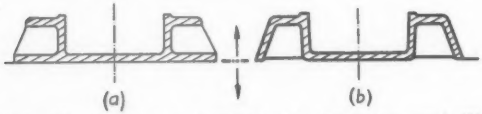

FIG. 19.—*Core elimination: (a) defective and (b) improved designs.*

Observations on the Scheme

A quite different arrangement could have been adopted, *i.e.* based on the designers' point of view and giving rules based on the type of casting—frames or bed-plates, wheels and bearings—or based on the components of these castings:—walls, brackets, ribs and arms. This was done to some extent with the marine steel-castings guide, which contained a work is not too lengthy and is presented in a way which is sufficiently interesting for the engineer or designer to take notice of their entire contents, and to be stimulated by the lessons to be learned.

METALLURGICAL CONSIDERATIONS

As mentioned earlier, certain rules have been proved by systematic tests, particularly in connection with the survey on foundry defects. It is, in fact, known that for a given material, defects which might otherwise be attributed to designing by an ill-informed foundryman, can be avoided by giving due attention to certain factors in production.

M. Le Thomas has had castings made in the experimental foundry of the *Centre Technique* which were deliberately faulty in design and defective in feeding arrangements (Fig. 20). Out of a series of a hundred castings from a given iron one hundred per cent. of the castings were sound (Fig. 21). Using a different cupola-charge, ninety-three per cent. of the castings were defective (Fig. 22). When these tests were planned, it was thought that a statistical survey of the data would be required, but their clarity rendered this unnecessary. This applies equally to recommendations on section sensitivity; it is the craft of the foundryman to produce a material which even in thin sections is still machinable.

For the light metals, systematic investigations have been carried out by Mr. Bardot (again in the experimental foundry of the *Centre*) on the effect of the size of fillets. A test-piece was specially

designed for this purpose with fillets adjacent to hollow or solid bosses[8]. Investigation showed that fillets did not cause micro-shrinkage defects when the radius was small enough; nor did these occur with larger fillets when the metal was thoroughly freed from gases, refined and de-oxidized, but with fillets of about 1 in. radius such defects occurred when the various treatments were not properly carried out. Micro-shrinkage defects were more pronounced when gases were present to a greater extent, and at a certain degree of gas content, appeared even with a fillet radius of only 5 mm. ($\frac{3}{16}$ in.).

ANCILLARY MATTERS

Differences of Opinion

It was not expected that these "Guides" would provide a general panacea for foundry design problems and troubles. There are considerable differences of opinion on moulding methods as between one foundry and another; these are due not only to differences in traditional practice, but also to differences in equipment. It is obvious that a highly-mechanized foundry producing castings in relatively large numbers will be more inclined to envisage improvements in design in co-operation with the customer, while this will be of secondary importance in a foundry which is more of the jobbing type, accustomed to allowing the moulder to exercise his skill—and sometimes even his fantasy!

The machining and fettling equipment available also affects ideas on moulding; for some well-equipped foundries it is of little consequence even though extensive operations be required on cutting, or removing large feeder-heads. Finally, the use of new processes such as exothermic feeding or shell-moulding facilitate—or sometimes on the other hand create difficulties in—co-operation between the foundryman and the user. Consequently, while agreement is easily reached on general principles, the opinions expressed by foundrymen are often at variance. The "Guides" facilitate discussion, but personal co-operation between foundryman and customer is still necessary and fruitful. Against the many instances when the foundryman will obtain the simplification desired, there will always be many occasions when the users will feel themselves compelled to adhere to casting designs which are not so well adapted to moulding methods, and it is then that the foundryman must show his craft, exercising his ingenuity if necessary, but in the full and mutual knowledge that he is doing so and why he is doing it.

Competition with Fabricated Structures

The preparation of the "Guide to Steel Castings Design" coincided with the development of fabricated assemblies of welded sheets. Certainly, improvements in design and in the simplification of moulding methods that might be anticipated from the circulation of the "Guide" would give the foundry support in the face of competition. The objection was raised by the foundrymen that the publication of these "Guides" coincided with that of the "Atlas of Defects" and was liable to influence the user against castings, but in the Authors' opinion this objection does not hold good, since the design of fabricated structures imposes even more restrictions on the designer, even though these restrictions are not indicated in as comprehensive a guide; moreover, the steelfounders' guide makes reference to composite assemblies in which

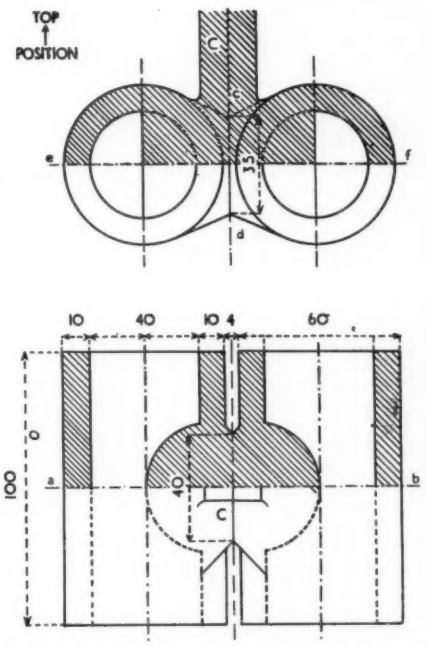

FIG. 20.—*Design for a test casting, intentionally combining a number of features which would normally militate against the production of a sound casting.*

sheets are welded to castings, for example, to effect difficult junctions. In some cases, the adoption of an arrangement of several cast components welded into one assembly is recommended.

Circulation of the "Guides"

As readers may know, the French *Centre Technique* is maintained by subscriptions from founders, and certain services are given in exchange. Thus, 2,000 copies of the "Guide on the Design of Steel Castings" have been sent to interested foundries without charge; and subsequently 4,000 copies have been sold either to foundrymen who ordered them in sets of 10 to 50 for their customers, or to engineering firms, or again to designers, and teachers at technical institutions, for their personal use. A number of copies have gone to Belgium, Italy and Spain. Discussions are in progress concerning translation into other languages.

Co-operation on Casting Design

The same remarks apply equally to the "Guide on the Design of Iron Castings," except that of this work, published only a year ago, only 2,700 copies have so far been circulated—all these having been sold. There are also projects for publishing at some date as yet unspecified, guides on the design of brass and bronze castings, and on the aluminium and magnesium alloys.

The French example of publishing guides on design has been followed in several other countries. A concise booklet has been published by the Steel Founders' Society of America by Charles Briggs, author of the "Metallurgy of Steel Castings," under the title of "Fundamentals of Steel Casting Design."[10] In 1951, a special number of the German journal *Giesserei* was devoted to this subject under the title "Designer and Foundryman."[11] This consisted of about a dozen papers, the majority of which had already appeared in that journal, by leading authorities in various sections of the German founding industry. Similar works have also been published in Russia. In Holland, the foundry organization at Delft has issued a work on this subject dealing with castings in various metals.[12] It is agreeable and gratifying to see the French work on steel castings is praised in nearly all these publications.

Direct Approach

Certain leading engineering firms have delegated a member of their staff to act as liaison officer with their suppliers of castings; some of them have even set up a co-ordinating section to which any schemes involving castings are submitted. This engineering representative, or internal section, is familiar with the resources of the different foundries with which the firms are in touch, and knows which foundries should be approached to deal with given types of casting. In this way, the burden on the foundry design department is reduced. Engineers undertaking this service keep in touch with the *Centre Technique* and pass on the more difficult problems which they encounter. In some cases, they have asked an engineer from the *Centre* to give one or more lectures on foundry technique and the design of castings to their own staffs, and Mr. Jaumain has undertaken this task.

These measures encourage loyal relations between customer and supplier, and to some extent they may lead to a classification of foundries according to the specific types of castings which they are best able to produce, based on their experience and equipment. Although this system has so far been applied only to a limited number of projects, it does offer interesting possibilities.

Discussions between Engineers and Founders

The publication of the design guides forms part of a policy of co-operation between the foundry industry and the engineering industry, within the framework of the professional organization. Although the infinite range of the engineering industry does not make this co-operation easy, the sponsors have made efforts to organize at Paris and at various provincial centres, meetings where mutual difficulties are discussed with considerable frankness, and, generally speaking, a great deal of goodwill is forthcoming from both sides which operate towards their solution. The mutual dependence of customer and supplier has been made clear during these discussions.

The question of patterns has been discussed in such deliberations: the foundryman obviously prefers that the making of the pattern should be left to him and, if possible, that the order for the pattern should be given to his usual supplier, since in this case he can follow his usual moulding practice and also choose the pattern according to the number of castings and probable future orders. He knows that by spending a little more money on the pattern, he may effect an economy which will largely compensate for the extra cost, and when the design engineer supplies the pattern, he is always afraid, perhaps wrongly so, that he will get a "soap box"—more or less damaged by previous use or transport, and on which he will be obliged to carry out repair work, even if not a complete reconstruction. On the other hand, the engineer does not want to be tied to a founder who will pass on to him the share of the pattern costs and who will specify that the pattern is to be kept at his disposal—but only in the supplier's pattern store. This

FIG. 21.—*Series of* 100 *iron test-castings of the design shown in Fig.* 20. *All proved to be quite sound—as a result of using a correct burden in the cupola.*

FIG. 22.—*Further series of* 100 *test-castings,* 93 *of which were porous because of a poor choice of raw materials for the cupola.*

question is closely bound up with the customer's integrity—an integrity which cannot be forced on the customer by measures that inconvenience him, but (only) by creating an atmosphere of mutual trust.

Despite all the difficulties in the way of co-operation, there is no doubt that these efforts have already borne fruit, and for a number of years now there has been considerable progress in mutual understanding among French founders and engineers. Who can say that this is not a general state of mind? Perhaps it is not too optimistic to think that (without abolishing free and healthy competition) the co-operation and mutual trust existing between foundryman and user may also be extended to other fields, within frontiers, as well as from one side of the frontier to the other.

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[7] *Guide Pratique de Tracé des Pièces Moulées en Fonte Grise, ibid.,* 1954.

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New Catalogues

Continuous Reheating Furnaces. Gibbons Brothers Limited, P.O. Box 19, Dibdale, Dudley, Worcs, have made good use of colour printing on the cover of a four-page leaflet which describes a new line they have acquired for the provision of economically-operated continuous reheating furnaces for billets, blooms, ingots and slabs.

Foundry Plant. The Constructional Engineering Company, Limited, Titan Works, Charles Henry Street, Birmingham, has just issued an attractive 16-page catalogue. It is significant of the importance of British foundry equipment in general, that this company claims to have installed its plant in no fewer than fifty countries. This is a very good reason why the essentialities of the brochure have been printed in French and Spanish. It opens with a section devoted to cupolas and auxiliary plant such as receivers and ladles, for these were the firm's original specialities. The range of plant and materials though extensive, is not exhaustive, which gives confidence that the firm is a specialist concern and not a "jack of all trades." The catalogue embraces the plant made by their associates the Adaptable Moulding Machine Company, Limited (moulding machines) and E. Tallis & Sons, Limited (moulding boxes).

Oil Engines. From W. H. Dorman & Company, Limited, Stafford, two catalogues have been received. One is their *Illustrated Spares Manual* which is very intelligently set out. Every component is illustrated, numbered and listed, which reduces requisitioning to the simplest proportions. The second one is an *Instructional Manual* for type 6DL series of six-cylinder oil-engines. In its 70-odd pages the user is given, in simple language, accompanied by illustrations where necessary, detailed information as to the maintenance of these engines.

House Organs

Kelvin Hughes Industrial Review, No. 2; published by Kelvin & Hughes (Industrial) Limited, 2 Caxton House, London, S.W.1.

There are two articles of interest to readers in this issue. One is on ultrasonic flaw detection and the other on colour-fastness testing.

600 Magazine Vol. 30, No. 133; issued by the 600 Group of Companies from Cunard Works, Chase Road, London, N.W.10.

The charm of this magazine is the rich mixture of serious publicity for the various works in the Group, its humour both printed and pictured, and its interesting general articles. Amongst the latter is one by Mr. Frank Rowe entitled "Moroccan Interlude."

New American Laboratory for Metals and Ceramics

A new laboratory for metals and ceramics research, costing nearly £2,000,000, was inaugurated recently by the American General Electric Company, at Schenectady. The main building measures 312 ft. by 160 ft., is partly on two floors, and has some 75,000 sq. ft. of floor space. The six sections of the laboratory consider metals and ceramics from four different view points: (1) Basic phenomena manifested by metals and ceramics; (2) their behaviour in terms of observation made on materials rather than in terms of basic and general conceptions; (3) uses of the materials and the processes for producing them; and (4) the evaluation of materials both technically and economically. Office accommodation and individual laboratory rooms are provided in addition to the extensive processing equipment. The rooms include laboratories for chemical analysis, metallography, small-scale experimental work; testing facilities for magnetic and dielectric materials, and other miscellaneous apparatus.

Facilities

For metallurgical research, facilities of the new building are divided into three general areas: melting, hot-working, and cold-rolling. Melting units include arc and other electric furnaces capable of being worked under vacuum, or with inert gaseous atmospheres as desired. Their capacities range from 5- to 500-lb. heats. An industrial-type three-phase arc furnace deals with 1-ton heats. Other equipment includes a 1,250-ton extrusion press, the hydraulic ram exerting a thrust of 2,500,000 lb. Rolling equipment includes 10-in. and 16-in. rod mills. In addition to conventional hot mills for sheet rolling, there is a Sendzimir planetary mill capable of reducing 1-in. slabs to ¼-in. strip in a single pass. There is also a 2,500-lb. forging hammer capable of hot working the largest ingots produced in the laboratory. The staff at present totals about 210, of whom nearly half are professional personnel.

Although GEC is not primarily a producer of metals or ceramics, virtually all its products include these types of materials and depend upon them for products from incandescent lamps to gas-turbine blading, etc.

John Summers Dividend Raised

A sharp increase in profits for the year ended October 1 last is announced by John Summers & Sons, Limited. The company is raising the dividend on the £9,000,000 ordinary capital to 12 per cent. The final dividend recommendation is 8 per cent. A year ago a 3 per cent. interim was paid on £6,480,000 and a final of 6⅔ per cent. on the present capital, which was offered for public subscription in October, 1954, by the Iron and Steel Holding and Realization Agency. The 1953-54 total was equivalent to 9 per cent. on £9,000,000. Group profits expanded from £5,243,682 to £8,670,448 in 1954-55 of which £800,000 (nil) is set aside to fixed assets replacement reserve towards the higher current costs of replacement.

A SECOND PARTY of craftsmen from the Austin Motor Company, Birmingham, left by air for Australia on January 10. They will be engaged for the next two years in training local labour in the British Motor Corporation car assembly plants. Leading the party was Mr. L. Matthews who is in charge of the B.M.C. unit factory project at Sydney. It is anticipated that about 100 Austin employees will have been flown out by the end of this year.

Nickel Industry in 1955

The International Nickel Company of Canada, Limited, reports that free world nickel production in 1955 again set a record with output estimated at about 190,625 tons. This is an increase of approximately 27,857 tons over the record of 1954.

The output of nickel-chromium alloy castings in 1955 was about the same as in the previous year. The heat-resisting types find their principal application in industrial heat-treating furnaces; the petroleum and chemical industries are also important users. The corrosion-resisting types are used in the chemical, food processing and petroleum industries. In addition, increasing amounts of corrosion-resisting alloy castings are being employed by the Atomic Energy Commission.

The use of Ni-Hard abrasion-resisting nickel-chromium cast irons for mill liners and grinding balls in the mining and cement industries showed a gain over 1954. Modification of one type of Ni-Hard cast irons has led to the development of materials having the same abrasion-resistance with a considerable increase in toughness. This will permit application of heavy-sectioned Ni-Hard castings in some fields where they are subjected to severe impact conditions.

Production of Ni-Resist corrosion-resisting nickel cast irons showed some improvement in 1955. These alloys are employed in components of industrial equipment where resistance to corrosion, heat and wear is required. The trade mark Ni-Resist has also been applied to new nickel-alloyed cast irons which are in a group of magnesium-treated, corrosion and heat-resistant, high-strength, austenitic cast irons. These new alloys have created considerable interest in the chemical processing and petroleum industries and among manufacturers of high-powered engines.

Molybdenum in Cast Iron

Mr. Milan Marolt, writing in *Livarski Vestnik*, the Jugoslav foundry journal, details a research made into the influence of molybdenum on cast iron. He has summarized his conclusions in the following statement.

Since 1925, alloys have been incorporated into grey irons with the objective of improving the mechanical properties. Mechanical properties can be enhanced in several ways of which one is by alloying, but this is not always economic. Molybdenum is one of the alloying elements produced in Jugoslavia from indigenous ores, iron- or calcium-molybdate.

In grey iron, this element gives a pronounced improvement in tensile strength; uniformity for a given composition of the structure in the various differing sections of a casting; improvement in the machinability of grey iron for a given hardness; and it increases wear- heat- and corrosion-resistance. Molybdenum also augments the ease with which machinable grey iron can respond to quench treatment in the same manner as steel.

There is included in the report of the methods used for the incorporation of molybdenum in the iron and examples are quoted of uses to which grey-iron castings alloyed with this element can be put.

SIR WILLIAM ROOTES, chairman of the Rootes Group, on January 10 visited, for the first time since the Singer works in Coventry and Birmingham passed into the Rootes group in December, the Coventry factory of Singers Motors, Limited. Sir William began his career there, over 40 years ago, as an engineering apprentice.

Silicon-carbide Shapes as Denseners in the Foundry

*By H. W. Griffiths, A.I.M., M.I.B.F.**

It is often necessary in cast-iron and non-ferrous foundry practice, and to a limited extent in steelfounding practice, to use some form of densener; when feeders cannot be conveniently placed to control the freezing rate, it is necessary to produce the desired effect by other means. A popular method is to introduce into the mould a form of solid medium which has a high heat-conductivity, so that the heat will be quickly drawn away from the thicker sections. This will produce a more uniform rate of cooling and prevent unsoundness. A suitable material and method of application are described.

Materials used for densening purposes in the foundry vary in their effectiveness. Some have a drastic action, others are much more restrained. Steel, cast iron, silicon-carbide, carbon, refractory brick, etc., have been used for densening in this way. In this short *resumé* of the use of denseners it is only intended to deal with silicon-carbide and to a limited extent with cast iron.

When using this technique great care should be taken that the feeders are not placed too near to the densener and thus counteract the efficiency of the feeding process. They should be located with due regard to the controlled progressive solidification of the metal concerned.

Nature of Hardness Conferred

It must be stressed that silicon-carbide denseners, when used to produce this progressive solidification, will not give a " pot-hard " surface on cast iron which is unmachinable or machinable only with difficulty, resulting in expensive tool wear. Silicon-carbide denseners are essentially deep acting, and the main function is to produce a fine close-grained machinable structure even on the surface. This structure extends much further into the mass of metal than is the case with a cast-iron chill. There is, however, some increase in hardness which together with the finer structure, results in excellent wear-resistant properties and, when machined the cast iron has a steel-like finish. This method of densening has now become widely used in many of the larger foundries in this country and very pleasing results have been obtained. When silicon-carbide denseners have been used experimentally on a special job and the results of the machining observed, the method is adopted for many other troublesome castings, with similar good results.

Advantages Claimed

Advantages of using silicon-carbide denseners over cast iron are many, and the main ones can be listed as follows:—

(1) When cast iron is used there is a grave risk of fusion of the chill on to the casting. This may be very difficult to remove and can even result in a casting being scrapped. Even if the casting is not wasted, cleaning it up may be a costly operation, perhaps necessitating welding and leaving an unpleasant mark on the casting. This risk is entirely obviated by the use of a silicon-carbide densener, as it will " strip " without the slightest difficulty, leaving behind a perfect finish.

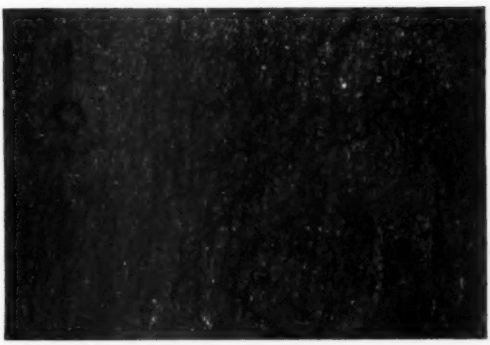
(2) Cast iron gives a " pot-hard " unmachinable face, whereas silicon-carbide gives a close-grained, machinable skin (Fig. 1).

(3) The face under a cast-iron densener is often marred by laps and misruns and these are difficult or impossible to remove on machining;

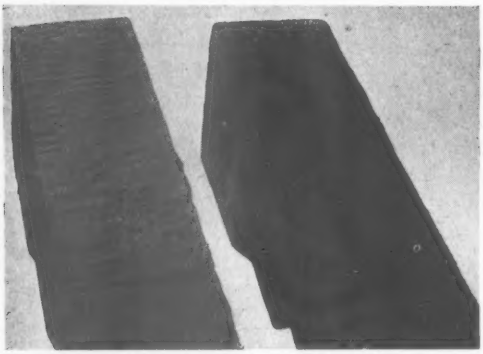
FIG. 1.—*Fractures of cast-iron blocks, showing the structure adjacent to (a) a cast-iron chill and (b) a silicon-carbide block (scale—full size).*

Cast-iron chill against this face.

Silicon-carbide block against this face.



* The Author is on the staff of the Carborundum Company, Limited, Trafford Park.



(*a*) (*b*)

FIG. 2.—*Appearance of iron blocks cast in contact (a) with a cast-iron densener and (b) one of silicon-carbide.*

this trouble is not normally encountered with silicon-carbide denseners (Fig. 2).

(4) It is essential that cast-iron denseners be clean and free from rust, as this can have a very serious effect on the finished casting. If rust is present and it is used in a green-sand mould, it is quite possible to have a "blown" surface under the densener. If the densener has the slightest coating of rust and is put into a dry-sand mould and coated with refractory material followed by drying, then when the metal is poured into the mould gas is evolved from the rust. The refractory is blown off and the densener is exposed to the molten metal, resulting in burning-on, and often in blowholes. silicon-carbide denseners are not prone to rusting, hence there is no danger from this source.

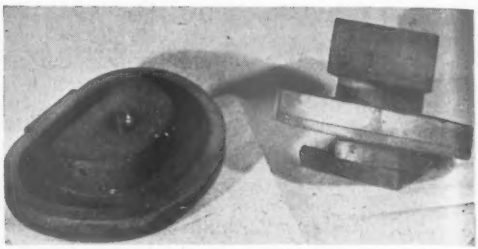


FIG. 3.—*Machined casting (left) for which a silicon-carbide brick was used as a densener in the manner indicated by the pattern (right) to produce a sound thick section.*

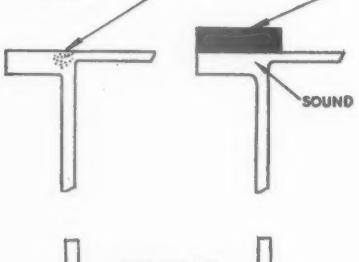
(5) The "life" of cast iron used for chills is very short, some people use them once only, others use them up to three times and then scrap them. There is always the danger of mixing between those used the maximum number of times, and the new ones. Those of silicon-carbide denseners are not prone to rust without any deterioration of their efficiency and their life is excellent, providing reasonable care is taken at the knock-out. Even when breakages do occur, the smaller pieces of the densener can be used for other jobs.

Densening Effect

If the section of a piece of cast iron which has been densened, using silicon-carbide shapes, is examined under the microscope, it is clearly evident that the effect is far different from that produced when a cast-iron densener is used. Cast-iron gives a very hard, coarse, cementite structure which can be unmachinable or machined only with difficulty.

FIGS. 4 TO 7.—*Sketches showing the method of applying silicon-carbide inserts adjacent to typical casting sections in order to promote soundness.*

FIG. 4.



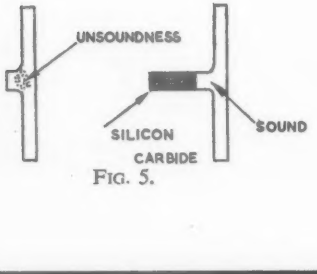


FIG. 5.

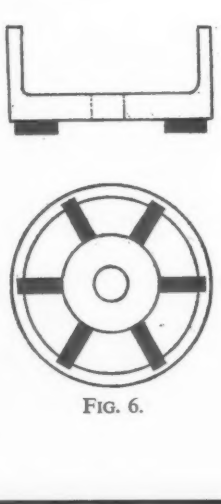


FIG. 6.

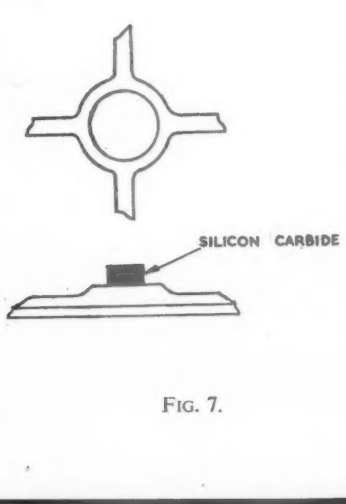


FIG. 7.

With a silicon-carbide densener, the structure is much finer, microconstituents are more evenly distributed and the metal is easily machined. The improved structure carries much farther into the specimen, and under certain conditions can be evident throughout the whole section.

It is due to this considerable improvement that silicon-carbide can be used for chilling castings where iron chills are difficult to apply. For example there may be a projection on the casting or space in the box may be insufficient to allow an iron brick to be placed in position. Silicon-carbide bricks can be put much further away and still exert a beneficial effect.

Method of Use

The use of silicon-carbide blocks or bricks is very simple and they may be applied on loam, dry-sand, green-sand or oil-sand moulds. The densener is placed in position on the pattern and the sand is rammed around them. Bricks are available with holes for fastening into a top-part. When the mould is complete, wet blacking is applied in the usual way to the surface exposed.

It has been reported that these bricks have been used successfully on large cores so constructed that the bricks are held together with about an inch thickness of loam on a core-grid. Venting is done in the normal manner from behind the face; the core is then wet-blacked and dried. After pouring, the mould is allowed to cool and then the casting is removed, leaving the core intact. This core may then be returned to the coreshop, touched up, re-blacked, and made ready for use again. This method, of course, only applies to the simpler type of core, but quite large ones can be made in this manner. There is naturally a big saving in cost. Fig. 3 (left) shows a machined casting; prior to the use of silicon-carbide the centre section was frequently unsound. The method of applying the silicon-carbide brick is shown in the second photograph (right) using the pattern to indicate the location.

It is important for economic reasons that silicon-carbide blocks should be carefully stocked and only be issued to the moulder with a note releasing them for a particular job. After use they should be returned to the store and then they will be ready for the next call. The number and location of the blocks in a mould or core should be left to the foreman who will decide their position and possibly mark the pattern accordingly. When the moulder receives such a pattern, he should count up the number of bricks he requires and withdraw that amount from the store. After the mould has been poured, he should pass on the information as to the number and position of the bricks to the knock-out crew, who will then be on the lookout for them. The bricks can then be collected and returned safely to the store. Even the smallest pieces of the material should be retained; these will be useful for the smaller castings.

Examples

Typical examples of the application of silicon-carbide blocks for densening are shown by sketches, Figs. 4 to 7. Fig. 4 illustrates a difficult section which can cause trouble, particularly if the top face has to be machined to any depth. Unsoundness could be present at the point indicated and would only show up on machining. A densener placed in the position indicated would give a very solid machinable face, with soundness throughout the section. The face would be hard and resistant to wear. Fig. 5 shows a section which could be troublesome, especially if the projecting portion were important, *i.e.*, if it was a bearing face and required machining. The densener placed in the position shown would give a very sound job. If denseners were placed in the positions shown in Fig. 6, at intervals around the face, a very dense structure could be produced. Fig. 7 shows an example where the use of smaller pieces of the material on bosses, when soundness of structure is essential.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

CANTERBURY, January 21—Castings for the year ending March 31, 1957, for the City Council. Mr. J. E. Rhodes, city engineer and surveyor, Municipal Buildings, Dane John, Canterbury.

HALIFAX, January 28—Manhole covers and frames, gully grates and frames, and other castings for the 12 months ending March 31, 1957, for the Borough Council. The Borough Engineer, Borough Engineer's Department, Crossley Street, Halifax.

HAVERFORDWEST, January 31—Cast-iron gully gratings and frames, manhole and footpath covers, etc., for the year ending March 31, 1957, for Pembrokeshire County Council. Mr. W. Brundan, county surveyor, County Offices, Haverfordwest.

HUDDERSFIELD, January 31—Cast-iron materials for the 12 months ending March 31, 1957, for the Borough Council. The Borough Engineer and Surveyor, High Street Buildings, Huddersfield.

INDIA, January 24—Tilting type crucible furnace, for the Director-General of Supplies and Disposals, Government of India. (ESB/467/56.)

Increases in Capital

DIRECTONICS ENGINEERING, LIMITED, London, S.E.15, increased by £49,900, in £1 shares, beyond the registered capital of £100.

TUBE INVESTMENTS, LIMITED, increased by £8,700,000, in £1 ordinary shares, beyond the registered capital of £14,300,000.

WELWYN ENGINEERING COMPANY, LIMITED, increased by £25,000, in £1 ordinary shares, beyond the registered capital of £25,000.

STEWARTS AND LLOYDS MINERALS, LIMITED, increased by £1,800,000, in £1 ordinary shares, beyond the registered capital of £200,000.

MINWORTH METALS, LIMITED, Birmingham, increased by £150,000, in 1s. ordinary shares, beyond the registered capital of £100,000.

EDWARDS HIGH VACUUM, LIMITED, Crawley (Sussex), increased by £75,000, in 4s. ordinary shares, beyond the registered capital of £300,000.

DOWTY GROUP, LIMITED, Cheltenham (Glos), increased by £500,000, in 10s. ordinary shares, beyond the registered capital of £2,500,000.

HIGH PRECISION ENGINEERING, LIMITED, London, E.C.2, increased by £124,900, in £1 shares, beyond the registered capital of £100.

C. & J. HAMPTON, LIMITED, toolmakers, of Sheffield, increased by £250,000, in 5s. ordinary shares, beyond the registered capital of £250,000.

A. L. DUNN & COMPANY, LIMITED, non-ferrous founders, etc., of Coventry, increased by £15,000, in £1 10 per cent. cumulative preference shares, beyond the registered capital of £10,000.

New Dutch Foundry Centre

In a recent issue of *Metalen*, the Dutch technical periodical which is the official organ of the *Nederlandsche Vereeniging van Gieterij-Technici* (Association of Dutch Foundrymen), Prof. Ir. D. Dresden describes in a leading article, "Foundry Technique in Holland begins a New Phase," the opening of a most up-to-date experimental foundry attached to the *Gieterijcentrum* (Foundry Centre) which itself is part of the Metaalinstituut T.N.O. (Dutch Institute of Metals).

Prof. Ir. D. Dresden, who is chairman of the *Nijverheidsorganisatie T.N.O.* (Federation of Dutch Industries), reminds readers of his editorial call for co-operation when he was editor of the first number of the *De Gieterij* (The Foundry) in 1927 and that this periodical was the forerunner of the present official periodical *Metalen*. As a result of this call the *Nederlandsche Vereeniging van Gieterij-Technici* was founded and this organization in turn brought the Foundry Research Centre into being, the planning of which goes back to the period of 1947-1951, but it took four more years to have these plans approved and to raise the money necessary for building and equipping this Centre.

The opening ceremony was performed by Prof. Dr. J. Zijlstra, Dutch Minister for Economic Affairs, at the invitation of Ir. S. H. Stoffel, chairman of the *Metaalinstituut*. Pressing a button, he set an oil-fired crucible furnace into operation and in a short period a memorial plaque, showing the initials M. I. (*Metaalinstituut*) and G. C. (*Gieterijcentrum*), was cast from this furnace. Speeches were then made by Ing. F. E. Spies, works manager of the Royal Dutch Blast Furnaces—and Steelworks—at Ymuiden, and Prof. Dr. G. Holst, representing the president-curator of the University of Technology. The Foundry Research Centre will deal with all problems of casting and moulding materials and special attention will be paid to correct moulding methods.

Absence of Uniform Power Ratings

The absence of uniform power ratings of equipment in this country is a matter which comes up for comment from time to time. In their joint statement circulated with the annual report of J. H. Fenner & Company (Holdings), Limited, Marfleet, Hull, Mr. C. Bradshaw, the chairman, and Mr. S. B. Hainsworth, the deputy chairman and managing director, point out that they have previously drawn attention to the danger which menaces the mechanical power transmission industry because of the inability of manufacturers of equipment to settle their engineering matters rationally.

"We are again beginning to reach a state of affairs where, for example, higher horsepowers are claimed for certain articles of equipment, not on the basis of what these articles are made from, or indeed on the performance they are capable of giving, but only so that the company making the claims shall have a competitive edge over the rest of the people in the industry," they state. "In this way madness lies, because, in the end, if the companies engaged in the industry are not careful, we shall come to the anarchist type of situation where there has been so much competitive bidding as to what particular types of product will do, that the results achieved show the product is useless on the ratings claimed."

Mr. Bradshaw and Mr. Hainsworth do not consider that there is any need for British manufacturers to fix prices in this field.

Solid-fuel Appliances

There has been a steady but positive trend towards the use of solid-fuel-domestic appliances of the modern type in Scotland over the past months; present indications from the Coal Utilisation Council, the appliance firms, and merchants all confirm a revival of interest in improved appliances and a volume of business which has resulted, in many instances, in delays in delivery. Reasons for this interest are: a determined preference for the traditional open-fire for domestic purposes, despite all its inefficiency in the older forms; a demand for improved performance in terms of better heat from the fuel consumed; and a demand for reduced heating costs. That these factors have had an influence on the steady flow of inquiries for new appliances can best be indicated by the fact that the Glasgow office of the CUC is handling perhaps twenty firm inquiries each day.

By and large, present interest is in free-standing open-fires which also provide convection heat; there is still a reluctance among housewives to instal closed fires in their living rooms, although the evidence suggests that such closed units are making very substantial progress in nurseries, dining rooms, offices and public rooms. The most recent types which can be set back into the existing fireplace meet the housewives' objection to a protruding unit, and considerable support has been given to stove units which protrude perhaps 3 to 6 in. beyond the older fireplace line. There is evidence that closed stoves will gradually be accepted, especially as the advantages to be gained become more fully appreciated.

Manufacturers of appliances have already done excellent work in publicizing their units, and the present flow of business and inquiries suggests that all the hard work of the past ten years is now bearing fruit. The biggest problem facing the solid-fuel industry has been the scarcity of coal—but even here there is a promise that the position is easing and that solid-fuel interests can go ahead boldly, promoting their appliances with come certainty of the right type of fuel being available.

Record Year for Steel

On January 12 the Iron and Steel Board announced that steel production in 1955 only just failed to reach the 20,000,000-ton mark. The year's output was 19,791,000 tons, which was the highest in any year and 1,271,000 tons more than in 1954.

Pig-iron production last year totalled 12,470,000 tons, which was an increase of 587,000 tons on the 1954 output.

The following table gives the latest steel and pig-iron output figures (in tons) and compares them with earlier returns.

Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1955—November	252,600	13,135,000	408,600	21,246,000
December	250,100	13,004,000	381,900	19,860,000
Year ..	12,470,000		19,791,000	
1954—November	235,300	12,236,000	377,000	19,606,000
December	233,600	12,149,000	354,700	18,442,000
Year ..	11,883,000		18,520,000	

DARWINS, LIMITED—Mr. Herbert E. Hill has joined the board of the company and its subsidiaries. Mr. Hill is chairman of Birfield Industries, Limited.

International Foundry Congress and Fair, 1956

Elaborate Preparations nearing Completion in Düsseldorf

Based on an estimate of up to 3,000 registrations for the technical sessions and an attendance of 100,000 at the exhibitions, the plans for this year's International Foundry Congress and Fair (GIFA) at Düsseldorf are nearing completion. The Congress is being held under the auspices of the International Committee of Foundry Technical Associations, the *Verein Deutscher Giessereifachleute* (VDG) (German Foundry Association) being the host group. At Düsseldorf, the place of Mr. Y. R. W. Granström (Sweden), last year's president of the International Committee of Foundry Technical Associations, who retired on January 1, will be taken by the new president of the Committee, Mr. M. Vuilleumier (Switzerland). At the same time, Dr. A. B. Everest (this year's national president of the Institute of British Foundrymen) will take his place as vice-president of the International Committee.

Simultaneously with the technical sessions, Council and committee meetings, and works visits in Düsseldorf during the period September 1 to 9, there is to be held a Foundry Trade Fair, this under the auspices of NOWEA (*Nordwestdeutschen Ausstellungs-Gesellschaft, mbH*). At the termination of the Congress period in Düsseldorf, there is also to be a post-Congress tour of one week's duration, when about 40 works (mainly in Munich/Frankfurt area) will receive delegates. A separate and complementary programme of excursions and entertainment is planned for the ladies. Düsseldorf makes an ideal centre in Germany for a foundry gathering of the type envisaged. Not only is the much rebuilt city the centre of an area rich in foundries, but it is easily accessible by rail and by air, there is ample hotel accommodation, and the city possesses a unique permanent conference and exhibition centre, having its own organizing body and providing full supplementary services.

General Arrangements

Much information about the general arrangements for the Fair was given last week at a Press conference in Düsseldorf attended by the writer. The gathering, which included technical journalists representing most European countries and the United States, was first welcomed by Dr. H. Engst, director of NOWEA, who presided. He referred briefly to previous foundry exhibitions held at Düsseldorf in 1925 and 1936 as a prelude to announcements about the 1956 proposals which were next introduced, in turn, by representatives of the sections concerned.

Dr. Ing. G. Schwietzke (chairman, VDG) explained developments in the sphere of international foundry collaboration which led to the decision to hold this year's Congress in Düsseldorf and to support it also with a Foundry Trade Fair—not merely an exhibition of foundry plant. It was hoped in this way, he said, to make the proceedings in Germany fit to rank with last year's Congress in London and previous Congresses held in Florence, Paris, Atlantic City and elsewhere.

The next speaker, Mr. W. Hövelman, chairman of the German foundry employers' association, explained the extent of participation in the Fair by the German iron, steel and malleable founders. This section will cover displays of (*a*) cast domestic appliances, builders' and constructional castings and the like, and (*b*) cast components and finished machinery. The importance of this part of the German industry, he said, could be gauged by its current output of about 3.5 million *tonnes* of iron castings compared with that of the UK of about 4.5 and France 1.5 million *tonnes*.

A most interesting survey of the non-ferrous foundry industry in Germany was then given by Dr. H. Roeder, chairman of the Central Association of German Founders, who represented the *Gesamtverband Deutscher Metallgiessereien* (GDM) operating within the framework of GIFA. (The badge of this non-ferrous association is a portrait of the patriarch bronze founder, Peter Vischer 1455—1529, a replica of which in cast bronze was presented to each of the journalists present.) He explained that to-day there are 1,300 concerns in Germany making non-ferrous castings, the west-German section employing about 25,000 men. The 1954 production in Germany of heavy non-ferrous castings was quoted as 80,000 *tonnes* and 69,000 *tonnes* of light alloys, the total for 1955 being expected to exceed these by about 25 per cent. The contribution of the non-ferrous founders to the 1956 exhibition would, Dr. Roeder stated, include displays of castings in aluminium, magnesium, copper, copper-base and zinc alloys made by various processes—*viz.* sand castings, gravity- and pressure-die-castings, centrifugal castings, extrusion castings and compound (bimetallic castings); also ornamental castings.

Special " Design and Casting " Exhibit

It fell to Dipl. Ing. A. Heuvers (director of Gussstahl-Werk Bochumer Verein AG) to explain to the conference the significance of the special feature exhibit at the Fair entitled " Design and Casting." This is to be a joint effort by the VDG and the VDI (*Verein Deutscher Ingenieure*) and will indicate with drawings, models, patterns, castings, etc., important phases of design and production collaboration between these two bodies. Development of techniques; new cast materials; advantages of unrestricted shape for components, and stages from design to fettled casting, are features which will be separately stressed.

Plant and Equipment

The section of the Fair to be devoted to plant, mechanization, handling foundry supplies and equipment was next described. Dipl. Ing. W. Gessell, of the State School of Engineering, Duisberg, briefly surveyed the types of machinery which would be

International Foundry Congress and Fair

housed in the 50,000 sq. ft. of floor space devoted to this section—embracing all foundry processes from raw-material arrival to castings despatch and to include special displays of equipment for new processes (shell moulding, CO_2 Process, etc.). Many of the exhibits would be "live," *i.e.*, in actual operation, producing molten metal, moulds, cores, etc. The section to be allocated to materials used in the foundry was described by Dr. F. Roll of Duisberg Technical College; these will be grouped under the respective headings of metals and alloys, hardeners and additives, moulding and core sands, bonding agents, refractory materials, fuels and sundries. Testing and inspection machinery, equipment and instruments will also be included in this part of the Fair.

As the final item in the review of the set-up of the Fair, Mr. L. Frede, lecturer at the Technical Training School, Essen, described vocational training schemes operated in German foundries and training establishments and which are to be featured in special displays. These have the objective of showing to young men and their parents, just what goes on in a foundry and the types of products made there—both rough castings, finished articles, and intermediate stages.

Of the total of 450,000 sq. ft. of conference halls, restaurants, display halls, etc., made available by NOWEA at Düsseldorf for the Foundry Congress and Fair, approximately 190,000 sq. ft. has been allocated for exhibitions. These comprise (in addition to the equipment and materials section) approximately 67,000 sq. ft. for the iron, steel and malleable section; 30,000 sq. ft. for raw materials and 43,000 sq. ft. for the special "Casting Display." One of the halls will also house the stands of the foundry organizations for other European countries. Unfortunately, there being no all-embracing British foundry employers' association, this country will not be represented in this way.

Congress Programme

A day-by-day scheme for the technical programme envisaged for the period September 1 to 9 at Düsseldorf has already been printed* and it is expected that full details will be available in the next few weeks. About 40 papers will be available for presentation at the two simultaneous technical sessions occupying two full days of the Congress. For the rest, there will be civic receptions, committee and sub-committee meetings, in addition to excursions, entertainment and works visits in the Düsseldorf area. The closing banquet will be held in Düsseldorf on Saturday, September 8. Amongst the technical papers will be the official exchange papers from the constituent countries of the International Committee including at least one from this country. For the convenience of foreign delegates, simultaneous translation of the proceedings of the meetings into other principal European languages has been arranged.

Also reaching finality is the programme for the post-Congress tour and details of this and the social excursions, entertainment and works visits in the shortly be printed. On Sunday, September 9, a special train will take two parties, A and B, first to Frankfurt (which party A will use as a centre) and then party B will continue to Munich (their headquarters). Group A will sub-divide itself later into two sections for some of the visits, which will mainly be to foundries in the Mannheim, Stuttgart and Konstanz areas. Group B, though centred on Munich, will include these same areas in its itinerary but take a trip to Heidelberg, in addition.

Note to UK Participants

Those members of the Institute of British Foundrymen who intend (or are hoping) to form part of the official party to the German Congress—and possibly also the post-Congress tours—are advised to register immediately with the IBF secretary, Mr. G. Lambert, St. John Street Chambers, Deansgate, Manchester, 3, who will supply information, details of accommodation, charges, and application forms as they become available. Block booking of hotel accommodation will be made for this party according to individual requirements. Others who may wish to travel or participate independently are also urged to register a note of their intention with Mr. Lambert—it may help when applying for currency, for instance—but for accommodation these persons should write preferably to the Fair organizers in Düsseldorf, who have in hand the allocation of much of the hotel room available. The address of this body (NOWEA) is Düsseldorf, Ehrenhof 4 (London agents: John E. Buck & Company, 47, Brewer Street, Piccadilly, London, W.1 (telephone: GERrard 7576).

*See JOURNAL, January 5, page 11.

Board Changes

HENRY MEADOWS, LIMITED—Sir Guthrie Russell has joined the board.

RHEOSTATIC COMPANY, LIMITED—Mr. Eric F. Wilkins has been appointed to the board.

ROBEY & COMPANY, LIMITED—Mr. Arthur Crompton has been appointed to the board.

RICHARDSONS WESTGARTH & COMPANY, LIMITED—Mr. W. R. Jones has been appointed a director.

ALUMINIUM WIRE & CABLE COMPANY, LIMITED—Mr. W. H. Bowman, a director of T. I. Aluminium, Limited, has been appointed to the board.

Recent Wills

SIMON, J. C., a founder director of Robert Hyde & Son, Limited, iron and steel founders, of Stoke-on-Trent £31,738

PAM, MAJOR ALBERT, chairman of the Pressed Steel Company, Limited, the Continental & Industrial Trust, Limited, and vice-president of the Hydro-Electric Securities Corporation and International Holdings, Limited £217,318

LEGGE, BRIG.-GEN. R. F., formerly a director of the Britannic Electric Cable & Construction Company, Limited, and the Pitter Gauge & Precision Tool Company, Limited, former general manager and a director of the British Power & Light Corporation £33,124

International Standards for Cast Iron

*Meeting of Technical Committee I.S.O./TC 25**

At a recent meeting of Technical Committee I.S.O./TC 25 Cast Iron, at the British Standards Institution, presided over by Dr. J. G. Pearce, three major points came in for consideration:— (1) First the Committee defined its terms of reference; (2) it then gave attention to its main objective—the determination of a test for the quality control of grey-iron castings, and (3) future work was reviewed especially in connection with Dr. Collaud's researches which have been concerned with the correlation of results obtained from test-bars with those taken from castings. A decision was made to establish liaison with the appropriate committee of the International Committee of Foundry Technical Associations and working party No. 5 of the European Coal and Steel Community, which is to produce and designate by symbols, the pig-irons of the participating countries. It was decided to confirm a recommendation for the use of a cast bar 30-mm. dia., and two bars machined therefrom for tensile testing, *viz.*:—(a) A standardized machined type A, shown in Fig. 1, is put forward as the basis for an international commercial classification for grey-iron castings; it is of the "diabolo" type; (b) a standardized machined type B, shown in Fig. 2, is put forward as the basis for comparison, in the research field of the mechanical properties of grey cast iron. It is of the cylindrical type at least 55-mm. long. The essential dimensional characteristics of these two test-pieces are set out in the recommendations made by the committee. The method of casting and the casting temperature have been discussed, but in this connection a liberal view had to be taken as there were many diverse opinions to be reconciled. A scale of quality for grey-iron castings was proposed as is set out in Table I.

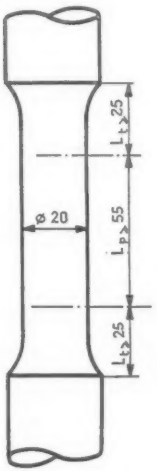


FIG. 1 *above.—Type A standard tensile test-bar for cast iron.*

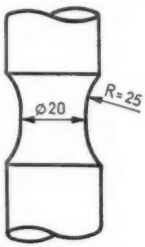


FIG. 2.—*Type B tensile test-bar recommended for use in research work.*

Future Work

Dr. Collaud (Switzerland) has formulated principles upon which he has built a method of correlating the mechanical properties of a test-piece and those obtained in actual castings (tensile strength, modulus of elasticity and hardness). Many such tests have been carried out in various countries and a final opinion was hoped for. The cases of malleable and nodular iron were discussed and it is probable that special committees will be established to deal with these.

TABLE I.—*Recommended Scale of Quality of Grey Iron.*

Scale of Quality.	Tensile strength (tons per sq. in.)
10	9.5 max.
15	9.5 min.
20	12.7
25	15.9
30	19.0
35	22.2
40	25.5

* Based on a report published in the *Journal d'Informations Techniques des Industries de la Fonderie.*

Dollar Export Talks

Sir William Rootes, chairman of the Dollar Exports Council, left London for North America on January 11 for a series of high level discussions between British, Canadian, and United States businessmen on methods of increasing Britain's trade to the dollar countries. He was accompanied by Mr. Peter Young, chief executive of the Council.

After preliminary talks in New York, Sir William will join other members of the Council in Toronto for a meeting with their Canadian counterpart, the Dollar Sterling Trade Council, which was convened on Monday last.

Other members of the Dollar Exports Council who are taking part in the talks are Brig. W. H. Crosland, chairman of Parson & Crosland, Limited, iron and steel merchants and exporters, etc., of London, E.C.2; Sir Norman Kipping, director-general of the Federation of British Industries; Sir Percy Lister, chairman of R. A. Lister & Company, Limited, electrical and general engineers, of Dursley (Glos); Lord Rochdale, president of the National Union of Manufacturers; and Sir John Woods, a director of the English Electric Company, Limited.

Mr. A. R. W. Low, Minister of State, Board of Trade, will be in Toronto at that time and has agreed to take part in the discussions. Sir Archibald Nye, the United Kingdom High Commissioner, will also be present. The Dollar Sterling Trade Council's object is to increase the flow of Anglo-Canadian trade.

Mr. Young will precede Sir William Rootes on an extended tour of Mexico, Cuba, and Venezuela for talks with the Dollar Exports Council's representatives there.

Employment at New Peak

Civil employment reached a new peak in November with a record figure of 23,110,000, which was an increase of 40,000 from the level ruling a month previously and was 290,000 more than a year earlier. There were 216,000 unemployed, 10,000 less than in mid-November and 41,000 less than in December, 1954.

In the week ended November 26, overtime was worked by 1,820,000 employees in manufacturing concerns which made returns to the Ministry of Labour. This was 260,000 more than at the time of the previous survey last August and 130,000 more than in November, 1954.

During the month manufacturing industries gained a further 27,000 workers, 16,000 going into the metal industries. Of the approximate gain of 290,000 in employment during 1955, nearly 200,000 went into the metal industries. Coal mining, on the other hand, lost about 5,000 workers.

Pig-iron and Steel Production

Statistical Summary of November Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table I summarizes activities during the past six months. Table II gives production of steel ingots and castings in November, and Table III, weekly average production of finished steel. Table IV gives the production of pig-iron and ferro-alloys in November, 1955, and furnaces in blast. (All figures weekly averages in thousands of tons.)

TABLE I.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production.*

Period.	Price Index, 1938 = 100.			Iron-ore output.	Imptd. ore used.	Coke to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	I. & S.	Coal.	All comdts.						Imports.[1]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[1]
1953	260	350	323	304	207	237	215	188	17	339	262	962
1954	263	364	325	299	234	238	229	198	7	356	277	831
1955—June[2]	269	368	331	263	223	221	217	206	31	364	286	866
July ..	272	423	338	294	230	241	231	170	29	308	254	999
Aug.[2]	283	423	338	307	244	245	236	189	36	345	256	1,200
Sept.	284	424	338	333	247	251	246	224	37	398	329	1,224
Oct. ..	284	424	340	334	249	257	249	225	34	399	332	1,163
Nov.[3]	285	431	343	331	259	261	253	228	36	409	—	1,155

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in November* 1955.

District.	Open-hearth.		Bessemer.	Electric.	All other.	Total		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derby, Leics., Notts., Northants and Essex ..	—	3.7	14.1 (basic)	2.3	0.1	19.0	1.2	20.2
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire	1.8	35.0	—	2.4	0.5	38.3	1.4	39.7
Yorkshire (excl. N.E. Coast and Sheffield) ..								
Lincolnshire	—	39.1	—	—	0.1	39.0	0.2	39.2
North-East Coast	0.8	78.0	—	1.5	0.5	78.7	2.1	80.8
Scotland	3.6	43.9	—	2.4	0.5	48.1	2.3	50.4
Staffs., Shrops., Worcs. and Warwick ..	—	18.8	—	1.4	0.8	18.9	2.1	21.0
S. Wales and Monmouthshire	5.4	79.6	7.1 (basic)	1.3	0.1	92.7	0.8	93.5
Sheffield (incl. small quantity in Manchester)	9.2	34.0	—	11.8	0.5	53.4	2.1	55.5
North-West Coast	0.1	1.7	5.8 (acid)	0.6	0.1	8.2	0.1	8.3
Total	20.9	333.8	27.0	23.7	3.2	396.3	12.3	408.6[3]
October, 1955	20.6	326.1	26.7	23.0	3.1	387.4	12.1	399.5
November, 1954	20.6	309.1	23.6	20.3	3.4	365.8	11.2	377.0

TABLE III.—*Production of New Non-alloy and Alloy Finished Steel*

Product.	1953.	1954.	1954.	1955.	
			October.	Sept.	October.
Non-alloy steel:					
Ingots, blooms, billets and slab	4.7	5.1	5.4	5.7	5.2
Heavy rails ..	8.7	9.6	9.4	10.3	9.8
Sleepers, etc. ..	2.2	1.9	2.3	1.8	1.8
Plates ⅛ in. thick and over ..	46.5	47.0	49.3	50.2	51.6
Other heavy prod.	43.9	45.8	49.8	50.8	52.7
Ferro-concrete rods, etc. ..	5.1	5.9	6.5	7.3	7.0
Wire rods and other rods ..	15.6	19.7	22.9	22.9	24.1
Light rolled prod.	44.2	41.2	46.3	48.8	52.0
Bright steel bars ..	6.7	6.3	7.3	8.5	8.4
Hot-rolled strip ..	18.8	21.7	24.0	26.2	26.4
Cold-rolled strip ..	5.2	7.0	7.6	9.0	9.1
Sheets, incl. coated	34.1	38.8	40.8	42.5	44.4
Tinplate, terne- and blackplate ..	14.9	16.8	17.2	18.2	16.7
Tubes and pipes ..	20.1	20.0	19.6	26.4	24.5
Tube, pipe fit'gs ..	0.3	0.4	0.4	0.5	0.5
Tyres, wheels and axles	4.4	4.7	5.1	4.9	5.1
Forgings (excl. drop forgings) ..	3.1	2.6	2.7	2.7	2.9
Steel castings ..	4.0	4.0	4.0	4.6	4.6
Tool and magnet steel	0.3	0.2	0.3	0.3	0.4
Total	282.8	298.7	320.9	341.6	347.2
Alloy steel	13.7	13.2	14.2	16.9	16.8
Total deliveries from U.K. prod.[4] ..	296.5	311.9	335.1	358.5	364.0
Add: Imported finished steel ..	6.8	5.0	2.6	27.4	25.0
	303.3	316.9	337.7	385.9	389.0
Deduct: Intra-industry conversion[5] ..	42.6	41.5	46.4	57.6	57.8
Total net deliveries of new material ..	260.7	275.4	291.3	328.3	331.2

TABLE IV.—*Production of Pig-iron and Ferro-alloys during November,* 1955

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants and Essex	26	—	20.9	25.9	0.8	—	47.6
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire .. Yorkshire (excl. N.E. Coast and Sheffield) ..	7	—	18.8	—	—	1.7	20.5
Lincolnshire ..	10	—	37.5	—	—	—	37.5
North-East Coast	21	4.8	49.7	—	—	0.1	54.6
Scotland	9	0.8	16.1	1.7	—	—	18.6
Staffs., Shrops., Worcs., and Warwick ..	7	—	9.7	1.5	—	—	11.2
S. Wales and Monmouthshire	9	4.7	34.0	—	—	—	38.7
Sheffield	2	—	3.5	—	—	—	3.5
North-West Coast	9	19.0	—	0.2	—	1.2	20.4
Total ..	100	29.3	190.2	29.3	0.8	3.0	252.6[6]
October, 1955 ..	98	29.4	188.6	27.6	0.8	2.8	249.2
November, 1954 ..	96	27.2	176.9	27.0	0.8	3.4	235.3

[1] Weekly average of calendar month.
[2] Stocks mainly ingots and semi-finished at the end of the years and months shown.
[3] Five weeks, all tables.
[4] Other than for conversion into any other form of finished steel listed.
[5] Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.
[6] Material for conversion into other products also listed in this table.

Company News

ABWOOD MACHINE TOOLS, LIMITED—The directors have declared an interim dividend of five per cent., less tax, on the ordinary capital on account of the year ending March 31. A total of 15 per cent. for 1955-56 was forecast by the board when the company was formed and made public last March.

COVENTRY GAUGE & TOOL COMPANY, LIMITED—The company is maintaining a 6¼ per cent. tax-free dividend in respect of the year ended August 31 last on a capital increased from £600,000 to £800,000 by a one-for-three rights issue at 13s. per 10s. ordinary share. The final dividend is 5¼d. net per share, equal to 4⅜ per cent., as a year ago.

BRAITHWAITE & COMPANY ENGINEERS, LIMITED—The company has declared an interim dividend of 4 per cent. for the year ending March 31, 1956, on capital of £450,000, as doubled by a scrip issue, against 5 per cent. on old capital. It is hoped that trading results will enable a declaration of a final dividend of 4 per cent., making 8 per cent., against 16 per cent. on the former capital previously.

LANCASHIRE STEEL CORPORATION, LIMITED—The directors are increasing the final dividend on the £4,500,000 ordinary capital from 6 to 8 per cent., making 11 per cent., less tax, for the year ended October 1, 1955. The previous year's total of 9 per cent. was the company's first payment since denationalization. Group manufacturing and trading profit, including investment income, etc., has risen from £1,895,150 to £2,942,366.

C.V.A. JIGS, MOULDS & TOOLS, LIMITED—CIC consent has been received in connection with the directors' plans for raising more capital for the company's development programme by the creation of 350,000 £1 preferred ordinary shares. Subject to resolutions being passed at meetings to be held on January 26, these shares will be placed privately, but it is not intended for the time being to seek a quotation for them.

AVELING-BARFORD, LIMITED, manufacturers of earth moving equipment, etc., of Grantham (Lincs)—The £600,000 debenture issue is in 5½ per cent. stock at a price of 99 carrying redemption dates 1974-76. This stock is being offered in the first place to the company's existing stockholders who were registered on January 3. Payment is due as to 50 per cent. by January 24 and the balance by February 21. Among the reasons for the raising of this new money are the shortening of credit from the company's suppliers and the need to reduce the company's bank overdraft.

TANGYES, LIMITED, makers of Diesel engines, pumps, etc., of Smethwick—A group trading loss of £1,662 is reported for the year to December 31, 1954, against a profit of £90,104 in 1953, while the net loss of £44,906 compares with a net profit of £22,004 previously. The chairman, Sir Basil Tangye, states that the loss is due to increased writing-down of certain stocks and to a reduced level of sales in certain markets for horizontal oil engines. In these circumstances no dividend is recommended on the preference or ordinary shares, whereas 5 per cent. was paid on the ordinary in the previous year. It is stated, however, that there is a healthy order-book at present and every indication that this will continue.

AN EXHIBITION—"Silicones in Industry"—staged by Midland Silicones, Limited, Upper Brook Street, London, W.1, is to be held at the Tea Centre, Lower Regent Street, London, S.W.1, from February 7 to 18.

New Patents

(Copies of complete specifications are obtainable from the Patent Office Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s.)

742,103. Aktiebolaget Akers Styckebruk, of Akers Styckebruk, Sweden.

An improved method of casting tubular metal bodies by centrifugal casting in warm permanent moulds. The insides of the moulds are provided with a lining produced of heat-insulating material, together with a minor quantity of adhesive. This method uses as a heat-insulating material, one of which the individual particles are porous, such as kieselguhr, so as to insulate the mould to a degree sufficient to ensure throughout a "grey" casting. Clay or bentonite is used as an adhesive in this particular patent, the material being applied as a suspension in such a way that even after application it retains its porosity. The relative proportion of porous heat-insulating material and adhesive is such that the lining will be sufficiently loose to permit withdrawal of the casting and removal of the coating by brushing away or similar method, but should also be strong enough to resist the attack of metal poured into the mould.

742,182. Sintercast Corporation, 134 Woodworth Avenue, Yonkers, 2, New York, USA.

Improvements relating to composite-material shaped turbine blades for use at elevated temperatures, involving the use of sintered refractory-metal carbides and particularly of titanium-carbide bonded by certain of the transition group 8 elements. This invention is of especial interest to producers of jet engines.

742,202. Société D'Electro-Chimie, D'Electro-Metallurgie et des Acieries Electriques d'Ugine, 10 Rue de General Foy, Paris, Seine, France.

A process for the reducing of silicon and sulphur contents of pig-iron. Molten pig-iron is treated with a slag containing substances which have desulphurizing effect, and also oxides of metals, not deleteriously affecting the pig-iron, capable of oxidizing the amount of silicon which it is desired to eliminate from the pig-iron.

742,361. Regie Nationale des Usines Renault, 8-10 Emile Zola, Billancourt, Seine, France.

Improved process for the manufacture of moulds of the lost-wax precision-casting type. The coating for the wax model in this invention is rendered unalterable by water by treatment with a solution of a volatilizable acid or salt of ammonium or of a weak organic base which is easily hydrolyzed in a solvent which does not dissolve the alkaline silicate.

742,455. Société Anonyme de Commentry Fourchambault et Decazeville, 82 Rue de Lille, Paris, France.

A process for the dephosphorization of steel or of pig-iron. It consists of the agitating and/or mixing in an oxidizing medium, a steel bath or a pig-iron bath with—as an additive—lime or a basic oxide, which is conveniently granulated and sufficiently pure and refractory for its complete fusion to be retarded. The slag formed is removed before its complete fusion. The additive should contain alumina or should have alumina added to it.

Personal

MR. J. RUSSELL, foundry manager of Qualcast (Wolverhampton), Limited, has been appointed a director of the company.

MR. G. W. HESLETT and MR. MARCEL ZUBLIN have been appointed to the board of Sulzer Bros. (London), Limited, with effect from March 1.

After 33 years' association with Brookes (Oldbury), Limited, engineers and ironfounders, Mr. GEORGE H. MERCER has retired as managing director.

Mr. P. BAVIRSTOCK has been appointed manager of the Manchester office of the Brightside Heating & Engineering Company, Limited, at 40, Byrom Street, Deansgate, Manchester, 3.

MR. G. E. RICHARDS, branch manager of the Morgan Crucible Company, Limited, Carver Street, Birmingham, will retire at the end of March after 40 years' service. He will be succeeded by MR. D. SCOTT, deputy branch manager.

A chair of chemical engineering has been established in the Faculty of Technology at Manchester University. Prof. FRANK MORTON, Professor of Chemical Engineering in the University of Birmingham, has been appointed to the chair and will take up his new duties in April.

MR. HENRY A. PRIME, M.SC., has been appointed chief engineer of electronic developments at the Brush Electrical Engineering Company, Limited, Loughborough. To take up his present appointment with the Brush organization, Mr. Prime travelled from Australia.

Mr. RALPH H. ATKINSON has retired as head of the platinum metals section of the International Nickel Company's research laboratory at Bayonne, New Jersey, after more than 30 years' service with the Mond Nickel Company, Limited, in the United Kingdom and its Inco affiliates in the United States and Canada.

After 42 years with the company, Mr. F. ARKLESS, chief mechanical draughtsman of C. A. Parsons & Company, Limited, turbine makers, electrical engineers, etc., of Newcastle-upon-Tyne, has retired. He was appointed to the post in 1932. Mr. J. DAWSON, chief draughtsman of the company's pipe division, has retired after 41 years' service.

Mr. BRIAN LAIDLAW GOODLET, at present deputy chief engineer at the Atomic Energy Research Establishment at Harwell, has been appointed chief engineer and a director of the Brush Electrical Engineering Company, Limited, Loughborough, as from April 1. Mr. Goodlet, who is 51, was named last year by Sir John Cockcroft, director of the Atomic Energy Research Establishment, as one of the two men chiefly responsible for the design of the first British power reactors.

The Government of Ceylon has invited Mr. MISHA BLACK to visit Colombo for consultations on the general planning of the Second Colombo Plan Exhibition, which will be held during February and March next year. Mr. Black has also recently been appointed to advise the Birmingham Chamber of Commerce on the visual improvement of the British Industries Fair in Birmingham. He is a partner in the Design Research Unit and is president of the Society of Industrial Artists.

So that he may devote the whole of his time to his political and other business activities, MR. WILLIAM ROBSON BROWN, who is Conservative MP for Esher (Surrey), is relinquishing his association with Richard Thomas & Baldwins, Limited, which has existed for nearly 20 years. In recent years he has been conference manager of the company, which he has consequently represented on many iron and steel conferences. Previously he was commercial manager (raw materials).

SIR GEORGE THOMSON and SIR HUGH WARREN have accepted invitations to become members of the technical committee of the International Tin Research Council. Sir George Thomson, who has been Master of Corpus Christi College, Cambridge, since 1952, is a Nobel Laureate in Physics. Sir Hugh Warren recently retired from the managing directorship of Associated Electrical Industries and was formerly for many years director of research to the British Thomson-Houston Company, Limited.

An appointment announced by the General Electric Company is that of MR. S. C. WELLS to take responsibility for oil industry equipment sales. Mr. Wells, who received his technical education at Loughborough College, joined the Witton engineering works of the GEC in 1923. After a few years there he was transferred to the sales organization at head office, where he had been engaged on the export side of the company's business. Mr. Wells has made a number of trips overseas on the companies behalf.

Mr. WILLIAM FALCONER, grate-fitter with the Sunnyside Iron Company, Limited, Falkirk, has retired after 67 years' unbroken service with the firm. He began work as an apprentice fitter in 1889 with the Forth & Clyde Iron Company, then located at Lock No. 16, Camelon, and when this company was merged with the Sunnyside Iron Company, Limited, he moved to Sunnyside Iron Works, where he completed the unique record. On behalf of the directors, Mr. Brown, managing director, presented him with a cheque.

Mr. PERCY BRUMMITT, who retired recently after 42 years' service with Newton, Chambers & Company, Limited, Thorncliffe Works, Sheffield, was presented with a clock from the clerical staff of the light castings department. Mr. H. H. Holt, general manager of the department, made the presentation. Mr. Brummitt is a vice-president of the Thorncliffe Recreational Football Club, and works with the Boy Scout Movement, the Ecclesfield Youth Council, Ecclesfield Farmers' Ploughing Society and is president of the Rural District Old People's Welfare Committee.

British Aluminium Company, Limited, announce that MR. S. F. DERBYSHIRE will relinquish his post as general production manager on reaching retirement age on February 17, but he will remain in a consultative capacity to the company for the time being. On the same date, MR. W. B. C. PERRYCOSTE and MR. J. SALTER will become joint general production managers. MR. P. T. ENSOR has been appointed general manager of the Canadian works of the company at Baie Comeau, where MR. A. R. WYLIE, formerly at the Lochaber Works, is now works manager designate.

Consequent upon the death of MR. ARTHUR E. LLOYD, chairman, and for over 36 years director and secretary of the Clissold Foundry Company, Limited, Spring Hill, Birmingham; Thomas J. Walford, Limited, Charles Henry Street, Birmingham, and John Lloyd & Sons (Engineers), Limited, Frederick Street, Birmingham, the following appointments have now been confirmed:—Of Clissold Foundry Company, Limited, and Thomas J. Walford, Limited, MR. W. T. ROBOTHAM, who has been director and manager for 23 years, becomes chairman and managing director; and MISS H. M. CRABTREE, who has been assistant secretary for over 30 years, is made director and secretary. MR. A. J. LLOYD is to continue as managing director of John Lloyd & Sons (Engineers), Limited.

News in Brief

IT IS JUST 100 YEARS AGO since Sir Henry Bessemer invented his pneumatic process for the manufacture of steel.

THIS YEAR C. T. Skelton & Company, Limited, toolmakers, of Heeley, Sheffield, is celebrating the centenary of its foundation.

MORE THAN 350 people attended the seventh annual ball of Sheepbridge Engineering, Limited, at the Victoria Ballroom, Chesterfield

WOLVERHAMPTON DIE-CASTING COMPANY, LIMITED, Graiseley Hill, Wolverhampton, has had plans prepared for the early erection of a factory at Bloxwich.

THE Federation of Light Metal Smelters announces that its maximum selling prices are now as follow:—LM1, £196 per ton; LM2, £198; LM4, £200; LM6, £206.

THE CARDIFF OFFICE of Mavor & Coulson, Limited, the Glasgow mining machinery manufacturers, is now at 4/5, Mount Stuart Square (telephone: Cardiff 26154).

THIS YEAR La Maquinista Terrestre y Maritima, S.A., of Barcelona, celebrates the centenary of their establishment. It is a large shipbuilding and general engineering concern.

IMPROVEMENTS and reconstruction work costing more than £2,000,000 are to be carried out at the Humber ports. At Hull the principal scheme will involve the expenditure of £1,500,000.

IT is announced that Scotts' Shipbuilding & Engineering Company, Limited, Greenock, has appointed Arthur Holland & Company, Limited, of 60, Fenchurch Street, London, E.C.3, as its London representative.

THE NEW NO. 4 blast furnace at the Margam Works of the Steel Company of Wales, Limited, was brought into operation on January 10. Mr. Harold Peake, chairman of the company, performed the lighting up ceremony.

THE FORTY-THIRD industrial chapter of the American Foundrymen's Society was officially installed on November 22 last, at Chesire, Conn. Known as the Connecticut chapter, this is the first AFS chapter in the New England area.

BRUSH EXPORT, LIMITED, a member of the Brush group of companies, has obtained a £360,000 contract for the supply and installation of equipment for the new Chopan steam power station, near Mirzapur, in the United Provinces, India.

A NEW BUILDING in Toronto has been taken over by F. Perkins (Canada), Limited, a subsidiary of the Peterborough Diesel engine company, which comprises offices, stores, and workshops. It has a floor area of 10,000 sq. ft. and has been designed in order to permit extension.

MR. J. H. WALTER, general sales manager of the spring balance division of Geo. Salter & Company, Limited, West Bromwich, has left England for a two-months export survey tour of West African territory, during which he will visit Kano, Lagos, Accra and Freetown.

THE DUKE OF EDINBURGH will open the Design Centre for British Industries, organized by the Council of Industrial Design, at 28, Haymarket, London, S.W.1, on April 26. From the following day it will be open on weekdays, including Saturdays, from 9.30 a.m. to 5.30 p.m.

A FOUR-CYLINDER DIESEL ENGINE made by F. Perkins, Limited, Peterborough, is now fitted by the Chrysler Motor Corporation of America as standard equipment in its Plymouth Belvedere car, it is announced. This is the first American car to be fitted with a British diesel engine.

ON JANUARY 11, Lord Sempill opened a course of lectures in Birmingham, organized by the College of Production Technology, covering work-study. The course will last until February 29, and the aim is to show how work-study can be applied to most aspects of production.

TO ENCOURAGE and expand the use of aluminium and aluminium products in Uruguay, Aluminium, Limited, Canada, has announced that it will buy a one-third share interest in Elaboracion General de Aluminio y Metales S.A., the principal aluminium-fabricating company in Uruguay.

FOLLOWING an order for two diesel mechanical locomotives for Lea Hall Colliery, the NCB has placed orders for a further five locomotives with W. G. Bagnall, Limited, Stafford. Of the five, two will go to Hem Heath, one to Norton, one to Hilton Main, and one to Littelton collieries.

HARLAND & WOLFF, LIMITED, has received a contract from Common Bros., Limited, Newcastle-upon-Tyne, for the building of two ore-carrying motorships, each of 14,000 tons d.w. The vessels are to be constructed in the firm's Govan shipyard. One is for delivery in March, 1957, and the other a year later.

EDGAR ALLEN & COMPANY, LIMITED, Imperial Steelworks, Sheffield, have issued a pamphlet to their workers pointing out the necessity and duty of wearing respirators and goggles when they are at work in the dressing and moulding shops. These are issued free but are not put to use by some of the men.

THIS YEAR the Castleford Ironworks, Limited, Bradley Street, Castleford, celebrates the centenary of its foundation. Little is known of its early beginnings, but there still exist in various works examples of the engines and machinery it made some 70 years ago. The firm now employs 40 men and makes iron castings ranging in weight from a few ounces to a ton.

TEN CANDIDATES have accepted nomination and have been declared eligible to contest the election for a new president of the Amalgamated Engineering Union, which is the second largest union in the UK. The election is due to the retirement in September this year of Mr. R. Openshaw, who succeeded Mr. J. Tanner in April, 1954. The last day for voting is March 5.

ALL cutting tools, hard-facing rods, wear- corrosion- and heat-resisting components formerly manufactured at the works of Deloro Smelting and Refining Company, Limited, at Deloro, Ontario, will in future be produced at the new division, Deloro Stellite, Belleville, Ontario, 30 miles south. The move includes the sand- chill- shell- and investment-casting activities of the firm.

CARRON COMPANY, Falkirk, has been authorized by the Minister of Fuel and Power to conduct official approval tests for domestic solid-fuel products—fires, cookers, and openable stoves. The work, which entails the measurement to a high standard of radiant heat, fuel consumption, boiler output, etc., will be carried out in the research and development test house at Carron, which is fully equipped for this exacting work.

ELECTRICITY AND TRANSPORT will be the theme of the eighth British Electrical Power Convention which is to be held at Torquay immediately after the Whitsun holidays, under the presidency of Sir John Dalton,

News in Brief

A.M.I.E.E., F.C.I.S., chairman, W. T. Henley's Telegraph Works Company, Limited. The Electrical Convention Exhibition, which will occupy 30,000 sq. ft. of the Torre Abbey Meadows, will be officially opened by Sir John on the evening of Wednesday, May 23.

FOR USE in various types of switchgear where previously cast iron had to be used, the Edgar Allen steel foundry has supplied four steel castings made by a special process, weighing only 2 qr. 16 lb., 2 qr. 8 lb., 1 qr. 26 lb., and 1 qr. 13 lb. These castings serve as yoke portions of solenoid operating-mechanisms, made by Reyrolle & Company, Limited, County Durham, for service up to 11 kv. in current ratings up to 1,200 ampères with breaking capacity ratings up to 350, 250 and 150 mva. This switchgear embodies thorough body insulation and air insulation, and is designed to meet the requirements of industrial users, or as a simplified standard for a supply authority.

CONSTRUCTION will shortly begin on a second large electric-arc furnace at the Stocksbridge, Sheffield, works of Samuel Fox & Company, Limited. Equipped with a swing roof and 20-in. dia. electrodes, the furnace will have a shell diameter of 20 ft., a transformer capacity of 20,000 kva, and will be provided with on-load tap change gear. The existing furnace, also made by Birlec, Limited, is claimed to be the biggest of its kind in the United Kingdom and one of the largest in Europe. The two furnaces, to be housed in the same building, will have a joint pouring capacity of approximately 150 tons and when operating simultaneously will consume sufficient power to supply the domestic requirements of a town with a population of 100,000.

BIRMINGHAM MUSEUM OF SCIENCE AND INDUSTRY has launched a scheme whereby bronze plaques, bearing a reference number are, with the permission of the factory occupiers, affixed to any machines still in use which have some historic value. The idea is that when the machines and equipment have ceased to be serviceable, they will not be scrapped but will be handed to the Museum. It has been found that employees tend to take care to maintain and preserve machines bearing the tablet. Among items thus reserved is a key-broaching machine still in use at the works of Archibald Kenrick & Sons, Limited, hardware manufacturers, of West Bromwich. About 50 years old, it is used for broaching the keyway in the plug of a cylinder latch. Other items reserved include a wall-planing machine for planing engine-beds and a 27-ft. horizontal mill-type engine.

WEDNESBURY TECHNICAL COLLEGE began, on January 12, an experimental course in modern foundry development, including an introduction to foundry management. The course, divided into a series of 12 lectures by eight specialists, is designed to serve young foundry workers who have passed their City and Guilds examination, or older men who hold supervisory positions. Head of the metallurgical department, Dr. D. Johnston, and Mr. H. A. McColl, principal, believe the course has a two-fold value. They say it will give up-to-the-minute information of foundry practice to ex-apprentices whose methods, however advanced their training, are bound to be several years behind the times. It will also give them a better insight into management problems—a subject which is included in advanced courses for engineering apprentices but not generally for foundry workers.

TEN OR MORE small Midland engineering firms from among the 900 member companies of the Engineering Industries Association are being sought to launch a new group apprenticeship-training scheme. The firms will pool their economic and physical resources to provide a five-year training course. The proposed group scheme is similar to that which the EIA is already running in the London area. The administrative cost of the scheme, including the salary of a group apprentice supervisor, amounts to £42 per year per apprentice. At a meeting in Birmingham on January 5 the organization of the London groups was described by Mr. E. L. G. Robbins, managing director of Industrial Administration, Limited. He referred to the shortage of skilled craftsmen in industry and said that three-quarters of the engineering firms in Britain employ fewer than 100 workers and account for half of all the workpeople in industry.

Obituary

JOHN CAMERON

The death has occurred, at the age of 86, of Mr. John Cameron, J.P., the well-known Scottish ironfounder. He was trained in the family business of Cameron & Roberton, Limited, of Kirkintilloch, now associated with Federated Foundries, Limited. He was succeeded on his retirement in 1945 by his eldest son. Unlike most of his contemporaries, Mr. Cameron took great interest in the technical aspects of foundry practice and was amongst the first to take up McLain's system of cupola control—that would be about 1920. From this time onwards he investigated each new foundry development and when Meehanite was introduced he was an early licensee of the International Meehanite Metal Company, Limited, and later a director of that concern. During the 1914 war, he went on a Government mission to Russia, whilst in the early 1920's Mr. Cameron visited India as a director of Eastern Light Castings, Limited. On the formation of Federated Foundries, Limited, he was accorded a seat on the board.

It was in 1917 that he joined the Institute of British Foundrymen, and became active in its affairs, ultimately becoming an honorary life member; several papers from his pen are to be found in the *Proceedings*. He was elected president of the Institute in 1925 and has since 1948 been its senior past-president. In a very practical manner, he was interested in international co-operation, and from 1926 when he visited the United States as head of a British foundry delegation, he participated in foundry congresses in Poland, Czechoslovakia, Italy, Germany, France and Belgium. Only advancing age kept him from attending the post-war gatherings. He was a recipient of the Oliver Stubbs medal in 1931 for his great services to the Institute.

He was a man of wide interests, which included the history of ironfounding, golf, tennis, cricket, amateur printing and philately. He held a very honourable position, not only in Scottish but also in national and international foundry circles. He had a gift for making friends, and these will be ever mindful of the manifold courtesies he invariably extended to them.

Mr. H. C. MEREDITH, of Thames Ditton, died on January 5, at the age of 79. He took over from his father the family brass and gunmetal foundry which had been founded in London in 1888. The business was carried out until 1941, when the premises were bombed. Mr. Meredith then set up his foundry at its present premises in Common Road, Claygate. It will now be carried on by his two sons.

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Raw Material Markets

Iron and Steel

Although the greater part of the foundry industry is at present well employed and was able to start another year with full order-books, it is difficult at this stage to assess the future position in so far as business is concerned.

The engineering and speciality foundries, in particular, have for some time been exceptionally busy. Orders for castings have been flowing in regularly, keeping plants fully occupied. Large tonnages of castings have been called for by steelworks and collieries, agricultural-implement and machine-tool makers, power-plant equipment manufacturers, and many other users in addition to the motor, tractor, and allied trades, which take the major portion of the output of the engineering foundries. There is plenty of work on hand, and the foundries can expect continued business at present levels from many of their customers; but whether the demand from the motor industry will be sustained is a matter of conjecture—it is felt that the credit squeeze and increased purchase tax at home, coupled with the growing competition abroad, are beginning to have an adverse effect on the industry.

So far the engineering and speciality foundries have taken up all available supplies of suitable pig-iron, and generally the quantities obtainable have been insufficient to satisfy their full requirements. Low-phosphorus and medium-phosphorus irons are still in short supply and deliveries of hematite, while on an improved scale, barely satisfy current consumption requirements. Many of the foundries are working on a hand-to-mouth basis, and increased supplies of refined pig-iron are being taken up to relieve the position.

The light foundries supplying castings to the makers of domestic utensils have for some time been feeling the effect of reduced buying of these articles due to economic restrictions, and at present they can see no prospect of the tide turning in their favour. Production of castings from these foundries is on a much reduced scale and some are on short time. Foundries supplying builders' castings also are not very busy. Most of the jobbing foundries are fairly well engaged. The reduced demands from the light foundries and also from other users of high-phosphorus pig-iron have resulted in producers of this grade being unable to dispose fully of current outputs. Stocks at the furnaces are rising, and this has enabled makers to accept orders from the Continent, to which an appreciable tonnage has been supplied recently.

There is still a brisk demand for heavy cast-iron and machinery scrap, and parcels arising are taken up promptly. The supply of the lighter grades of scrap is fairly good.

Foundry coke is coming forward in regular deliveries, but many foundries would like to improve their meagre stocks. The coke ovens are heavily committed and find it difficult to send increased tonnages, particularly in some of the Welsh grades.

Ganister, limestone, and firebricks are in good supply.

Non-ferrous Metals

The New York lead price was reduced on Friday by ½ cent a pound to 16 cents, thereby lowering the quotation to the level ruling 10 days earlier. The explanation for the failure of the metal to hold the increase stems primarily from the cutbacks in production in the motor industry on both sides of the Atlantic which brought about a decline in trading activity and a sharp fall in the London Metal Exchange quotation. However, the steady fall in the London price may prove to have been overdone, as the statistical position for lead is sound.

The zinc quotation has also been sliding back in London, but there has been no serious talk of the price being lowered in the United States in sympathy with lead.

Consumer demand both here and in New York is fair, but the outlook is still good. Slab-zinc production in the States in December advanced to 92,578 tons, against 87,616 tons a month earlier. Deliveries of zinc in 1955 reached a record, at 1,007,619 tons, and represented an increase of around 220,000 tons over deliveries in 1954.

Tin has been an indifferent market, especially in New York, although there are signs that demand is strengthening in the US. Forward metal in this country has dropped below the £800 level.

Copper has been in good demand on both sides of the Atlantic. In New York, activity has been strong, reflecting the continuation of the strikes in the fabricating industry and fears that they may spread. Last week the Office of Defence Mobilization authorized the release of 2,100 tons of copper from Defence Production Act inventories to help private companies flooded out on the West Coast. At San Manuel, Arizona, the San Manuel Copper Corporation has produced the first copper from its new low-grade copper-ore body. Production at full capacity is estimated to be in the region of 70,000 tons a year.

At an informal meeting of shareholders of the Rhodesian Selection Trust on Friday, Mr. R. L. Prain, the chairman, was questioned on his price stabilization policy.

Fixed-price copper sales by RST would be continued, he declared. Although most of the group's output was blister copper which could no longer be dealt with under the LME contract, he hoped that as the relatively small proportion of electrolytic copper produced at the Roan mine increased the group's sales through the exchange would increase.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* January 12, £385 to £386; January 13, £394 to £395; January 16, £386 10s. to £387; January 17, £387 10s. to £388; January 18, £394 to £395.

Three Months: January 12, £374 10s. to £375; January 13, £379 to £380; January 16, £373 to £374; January 17, £370 to £371; January 18, £375 to £376.

TIN, Standard—*Cash:* January 12, £816 to £817; January 13, £818 to £821; January 16, £815 to £817; January 17, £811 to £812; January 18, £810 to £811.

Three Months: January 12, £803 to £804; January 13, £803 to £804; January 16, £796 10s. to £798; January 17, £792 to £793; January 18, £795 10s. to £796.

LEAD—*First half January:* January 12, £117 5s. to £117 15s.; January 13, £115 15s. to £116. *Second half January:* January 16, £111 10s. to £111 15s.; January 17, £111 to £111 10s.; January 18, £114 5s. to £114 10s.

First half April: January 12, £116 to £116 5s.; January 13, £115 to £115 5s. *Second half April:* January 16, £111 5s. to £111 10s.; January 17, £110 15s. to £111; January 18, £113 to £113 10s.

ZINC—*First half January:* January 12, £100 15s. to £101; January 13, £99 15s. to £100 5s. *Second half January:* January 16, £96 10s. to £97; January 17, £97 to £97 10s.; January 18, £99 10s. to £99 15s.

First half April: January 12, £97 10s. to £98; January 13, £97 to £97 5s. *Second half April:* January 16, £93 10s. to £94; January 17, £94 15s. to £95; January 18, £96 to £96 5s.